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Sustainability: What To Sustain

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Introduction

A point not made often enough is that the logistics infrastructure of the United States Air Force (USAF) does *not* exist primarily to provide efficient peacetime support, but to enable the Air Force to fight and win wars. Therefore, any discussion of Air Force logistics structure and the doctrine for its operations must begin with three interrelated questions:

(1) Of the possible wars that the Air Force may be called upon to fight, which ones should serve as "design points" for United States (US) force structure and the associated logistics support structure?

(2) What is the US doctrine for the conduct of the wars so chosen as "design points," and what forces has the US acquired and planned to acquire to fight these wars?

(3) How should these forces be logistically supported to provide the maximum assurance of victory?

This paper will examine these questions in both nuclear and theater war contexts and explore the central features of each, plus relate these questions to the overall implications for Air Force logistics.

Several criteria must be considered in selecting combat scenarios which determine US force structure. The possibility of occurrence is an obvious criterion. A second one is criticality—the effect a defeat in a given conflict would have on national survival. A third is in the size of the demand that would be placed upon US forces and their support structure. In theory, consideration of these and other possible criteria could require detailed tradeoff studies and cause considerable debate about which scenario(s) should be selected. In fact, this has not been the case for theater war, where there has been general agreement for years upon which possible war was to be considered as the "design point" for US forces. Not too surprisingly, there has been less agreement on how a nuclear war might proceed.

Theater War

Whatever else can be said about the current bipolar balance of power in the world, it sometimes makes the job of the force and the logistics planner much easier. The only foreign power that poses a credible threat to the continued existence of the US as a superpower or as a nation is the Soviet Union. By comparison, any other possible adversary, or combination of adversaries, could be categorized as an annoyance. Any US force structure that is capable of meeting the threat posed by the Soviet Union should, unless there are special circumstances involved, be capable of dealing with the lesser threat posed by other possible enemies.

Further, it has been generally agreed that, while the conflicting interests of the two superpowers could produce conflict in a number of geographical locations in the world, the location that is most critical, if not necessarily most likely, is Western Europe.[1] As a result, US participation in a NATO defense of Western Europe has served for two decades as the "design point" for our general purpose forces and our intermediate and tactical nuclear forces. Also, through the years, there have been debates over what other possible conflicts should be adjoined to the Western European defense scenario; for example, the "one-and-a-half" versus the "two-and-a-half" war arguments. However, considering the longstanding shortfalls in our capability to meet even those demands posed by a NATO defense, non-European scenarios have been largely of theoretical interest, at least to the USAF.[2]

The extent of the Soviet threat to Western Europe is unlikely to diminish. Although much discussion of the wisdom inherent in the US commitment to our NATO allies has recently appeared in the public press, there are no indications that our current leadership intends to reduce this commitment.[3] Therefore, in planning for the future, US participation in the defense of Western Europe should remain as the combat scenario of greatest interest to our force and logistics planners.

"A European scenario would similarly produce enormous materiel and personnel losses."

Short War Likelihood

There are several excellent reasons to allege that a war in Western Europe is unlikely to be a protracted one:

(1) By all accounts, Soviet doctrine for an attack on NATO envisions a *blitzkrieg* using massed armor and artillery to break through the NATO forward defense and achieve victory within days or weeks.[4] NATO forces are not deployed for a defense in depth, and a strategy of trading territory for time is politically unacceptable to our West German allies. Therefore, the issue will probably be decided very quickly.

(2) The Arab-Israeli conflicts provide some of the most relevant indicators of how a future war might be conducted between modern armored forces, which are supported by modern aircraft and anti-aircraft systems. These conflicts, although short, resulted in enormous attrition on both sides. A European scenario would similarly produce enormous materiel and personnel losses.

(3) Furthermore, even if the US could spend the large sums required to attain the capability to fight a protracted war in Europe, the effort would be useless unless our NATO allies could be persuaded to do the same. There is little evidence that this is the case.

(4) As a result of the above, the US is committed to the first use of nuclear weapons if required to prevent a NATO defeat.[5] We have 6,000 nuclear weapons stockpiled in Europe to support this commitment. It is impossible to predict whether,

or when, a US President would choose to use those weapons. From the standpoint of effectiveness and the need to limit collateral damage, the logical first use would be to employ short-range, low-yield, tactical nuclear weapons against massed Soviet forces early to prevent any initial breakthroughs. This tactic might offer the best hope of keeping the ensuing nuclear war limited. In fact, once a Soviet breakthrough had occurred and armored columns had fanned out across the congested countryside, the use of our nuclear weapons would entail much higher civilian casualties and greater risks of escalation.

". . . the US should be prepared to fight a short, very intense conventional war which would escalate to a nuclear war at any time."

Therefore, the conclusion that emerges from an examination of the correlation of forces on both sides and the respective doctrines for the employment of these forces in Western Europe is that the US should be prepared to fight a short, very intense conventional war which could escalate to a nuclear war at any time.

In Retrospect

This paper will not offer opinions on the adequacy of the existing and planned force structure of the USAF to meet the demands posed by a war in defense of NATO. This subject has received extensive—and not entirely encouraging—discussion elsewhere.[6] Rather, we are concerned with the principal logistics implications of such a war. Probably the most difficult problem is the effects on US logistics doctrine and logistics planning when both sides use nuclear weapons. I will consider this prospect in a later section. The following discussion is based upon the assumption that only conventional weapons will be used by both sides.

An important observation is that the forces under consideration will be supported with what is already in theater and what can be transported there in a very short time, measured in days or at the most weeks. The main functions of the air logistics centers in the US will be to load out existing depot stocks for airlift to Europe and to provide technical teams to augment Air Force logistics personnel in theater. There would be too little time for the repair or manufacturing capabilities of the centers or their contractors to be of much assistance. In the combat theater, the emphasis will be on maintaining the highest possible sortie rates during the early days of the war, with aircraft that cannot be returned to service being stripped to provide spares to keep others flying.

A second aspect of this combat scenario that has probably not received enough attention and certainly not had enough resources allocated to it involves the condition that a European war would be the first time in almost 40 years that Air Force logistics assets were subject to attack and destruction by a determined and capable enemy. Our current planned location for storing the bulk of these assets, West Germany, places them within easy striking distance of short-range Soviet aircraft.

The Proposal

If one contemplates the problem of how to spend the available dollars to provide the best logistics support to the USAF under these circumstances, the choices then are clear. First priority must be given to:

(1) Acquisition of adequate war reserve stocks, based upon realistically high predictions of consumption and destruction by the enemy.

(2) Acquisition of sufficient intertheater airlift to move the logistics assets to Europe in time and sufficient intratheater airlift to make the required distributions and redistributions of these assets to the operating bases.

(3) Hardening and camouflage of logistics support facilities where possible to reduce the likelihood of their destruction.

(4) Acquisition of the equipment and the necessary trained personnel to support the highest possible sortie rates.

Preparation for interservicing NATO aircraft and provision for the back-up communications and data processing are two other measures which could be added to the above list. Within the inadequate funding now being provided, the Air Force is still pursuing limited initiatives in all these areas.

If increases in logistics funding could be obtained, the obvious first steps to be taken would be to increase the current levels of effort in ongoing Air Force programs. If the increases were large enough, the following additional actions could be considered:

(1) Greater reliance on prepositioning logistics assets in Europe.

(2) More construction of hardened support facilities.

(3) Additional reestablishment of general or specialized Air Force depots in Europe, preferably in areas which offer partial "sanctuary" from attack (Spain, Portugal, the United Kingdom, and certainly France, if ever it became politically possible).

"A short answer is that the relationship of readiness to sustainability is imperfect, and in some aspects, antithetical."

Sustainability

The preceding discussion presents a quick trip over ground that is very familiar to Air Force officers who have been concerned with logistics preparations for the possible theater war that US leaders have declared to be most critical to our survival as a superpower. A logical question to ask at this point is: How do the views presented in this discussion relate to the central theme of this paper's title? A short answer is that the relationship of readiness to sustainability is imperfect, and in some aspects, antithetical.

As noted earlier, there are good reasons to believe that a war in Western Europe would not last for an extended period of time. In addition, the territory that would be involved is certainly not vast. The limited and congested area that would be available provides one of the principal problems facing US operational and logistics planners. While some of the measures required for proper logistics support of the USAF in a European war are entirely compatible with US prosecution of a protracted war anywhere in the world, others may not be. For example, money spent on hardening European logistics facilities would do nothing to enhance our ability to support a conflict in the Persian Gulf. On the other hand, actions which could contribute to our ability to fight a protracted war, e.g., acquiring tooling to increase the surge capabilities of the repair shops of the air logistics centers and their contractors, would not affect our capability to win a truly short conflict.

The central point to be made is not that sustainability for protracted conventional conflict is a bad idea or that it should not be pursued as an objective by Air Force logisticians. In the abstract, it is a good idea and a worthwhile objective. However, it is not free. Therefore, questions of expenditures for sustainability must be considered in a frame of reference provided by the geopolitical situation of the US, our doctrine and strategy for dealing with that situation, and the competing demands for limited defense dollars.

Unless US policy changes significantly, or funding for Air Force logistics increases substantially, the capability of the general purpose and airlift elements of the Air Force to fight a protracted war anywhere in the world will be largely a fallout from providing these forces with the capability to fight and win a war (which may or may not be protracted) against the forces of the Warsaw Pact in Western Europe. This does not mean that Air Force logisticians will be precluded from taking intelligent and innovative actions to make our forces more sustainable. It does mean, however, that proposals for increasing sustainability which do not also provide a direct increase in Air Force capability to prevail in Europe are less likely to be funded than proposals which do, and so be it.

If any proposal in the former category is to be funded at all, it will not be sufficient for its advocates to base their case on a generalized need for "sustained mission accomplishment" over "vast territories." Rather, it will be necessary for them to be quite specific on where protracted wars might occur, the logistics requirements their protracted nature would impose, and the reasons that our existing logistics structure, although not optimal, would not be sufficient. These advocates must also show clearly that adopting their proposal would represent a better use of scarce logistics dollars than applying the same resources to existing shortfalls in our ability to support the Air Force in fighting that one theater war we must indeed *win*.

Nuclear War

Any discussion of sustainability must involve a nuclear scenario for several reasons. The first is the fact, as previously noted, that the combat scenario which serves as the "design point" for our general purpose and airlift forces envisions the possible early use of nuclear weapons. This could arise either by a US initiative to prevent NATO forces from being overrun or from a Soviet decision to provide additional firepower at a crucial juncture. A question then that needs some exploration is: What does "sustainability" mean in such a situation? Obviously, a European conflict is not the only possible theater nuclear war. However, because of the concentration of nuclear weapons in Europe, it would probably be the most intense one the US might have to face. Therefore, any discussion of the foregoing question should begin there.

The second reason is that protracted nuclear war has recently become a "hot" topic in Washington. The Secretary of Defense has announced—and been roundly denounced in some circles for doing so—that the US must be prepared to fight and emerge undefeated ("victorious" is a word that US leaders are very reluctant to use) from a long nuclear war.[7] One implication of this policy is that the question of sustainability must also now be considered for our central strategic forces.

Unfortunately, the above questions cannot be considered until a great deal of homework has been done. Credible combat scenarios, doctrines, and strategies for force employment in these scenarios must be produced. If these exist for US forces in possible protracted nuclear wars, they are well-kept secrets indeed.

This is not to say that *targeting* plans do not exist for US nuclear weapons. They certainly do for our central strategic and intermediate nuclear forces. For tactical nuclear weapons, the possible times and modes of employment would depend heavily upon the operational situation(s) at the times(s) that weapons release from the President could be obtained. Under such circumstances, target planning is quite a theoretical process.

What is lacking are generally accepted answers to such questions as how a protracted nuclear war might begin, how such a war might proceed, and how it might be terminated well on this side of Armageddon. One obvious answer to each question is: No one knows, and given the manifold uncertainties attending a possible nuclear conflict, no one *can* know. Political leaders on either side would be wise to take this view when they contemplate initiating a nuclear war. However, it is not a comfortable position for Air Force operational and logistics planners who must decide how to prepare for the eventuality.

The purpose of this paper is not to offer a solution to this problem (which may in fact be insoluble). Rather, it is to outline some steps that should be taken to better understand it. The first step should be one that sets up an analysis to determine the circumstances, if any, where the notion of Air Force participation in a protracted nuclear war would make any sense. It is difficult for this author, in light of the vulnerability of the Air Force weapon systems and support infrastructure involved, and the threat they face, to create a credible scenario for a theater nuclear war that would last long enough to make sustainability a question of much concern. However, others may have different views. If they can devise believable situations where the Air Force could be called upon to—and could—execute theater combat missions weeks, or even months, after nuclear combat had begun, these should be considered.

"For our manned bombers, 'sustainability' might consist of piecing together whatever was left of the surviving assets to mount 'one more try' at an attack on the Soviet Union."

Similar remarks can be offered about scenarios for protracted conflict between the central strategic forces of both superpowers. As soon as one departs from the short, cataclysmic exchange that has served as the "design point" for US central strategic forces for two or more decades, great difficulties are encountered, particularly in specifying the roles of Air Force systems. Any Soviet attack on the US, whether in a first or second strike mode, which did not involve a determined attempt to destroy our intercontinental ballistic missiles (ICBMs), manned bombers (however dispersed), and the supporting infrastructure for both of these Triad elements, would be, to say the least, illogical. If this argument is accepted, for our surviving ICBMs, sustainability would largely involve the question of survivable electric power and crew support. For our manned bombers, "sustainability" might consist of piecing together whatever was left of the surviving assets to mount "one more try" at an attack on the Soviet Union.

This above may be an unduly gloomy view. It may be possible to construct credible scenarios in which US ICBMs, and even manned bombers, remained operable and required sustenance for protracted periods after exchanges between the central strategic systems had begun. However, no one has yet provided convincing evidence that this is the case.

Therefore, it can be argued that the concept of sustainability for protracted nuclear war, either in theater or intercontinental, may prove on closer examination to be a "nonstarter" because no one can postulate any such war(s) that are credible from an operational point of view.

If acceptable and believable combat scenarios can be developed, the next step is to determine their logistics implications. These implications may be profound and could be highly prohibitive. The centralized and vulnerable Air Force logistics system that has evolved over the years is particularly unsuited to supporting forces in nuclear war, either in theater or at home. The measures taken to obtain peacetime efficiencies (for example, concentration of repair and distribution facilities or minimization of inventories for such expensive items as engines and avionics spares) have not been without concomitant penalties and tradeoffs.

"It seems certain that an Air Force logistics system designed for survivability and operability in nuclear war would be quite different from that which exists today."

The extent to which this situation could be remedied is a question first, of feasibility, and second, of economics. Further study may show that, regardless of the question of resource availability, the enormous destructiveness of nuclear weapons and the inherent vulnerability of both Air Force weapon systems and Air Force logistics infrastructure make the concept of sustainability in nuclear war an illusory one. Even if a viable concept for sustainability could be formulated, it is likely that implementation would be very, perhaps prohibitively, expensive. It seems certain that an Air Force logistics system designed for survivability and operability in nuclear war would be quite different from one which exists today. It might also be much less effective than today's system in supporting Air Force operations in conventional conflicts.

Conclusions

The central thesis of this paper is that long-term sustainability, like any other desirable and expensive attribute of good military force structure, cannot be considered in a vacuum. It must be examined in a frame of reference provided by the geopolitical situations the US faces, our national policy and military doctrine for conducting possible wars that these situations could produce, and the combat scenarios for those wars deemed most critical.

This point of view has been applied to a preliminary analysis of the two possible conflicts that have received the most attention over the years: a defense of Western Europe and a general nuclear war. In the first case, it appears that, given limited resources, the objective of sustainability in protracted conflict might not be entirely compatible with the objective of assuring a successful defense of NATO. In the second case, it is not clear that sustainability is in fact a sensible and realistic goal.

What is needed now are many more detailed analyses of these, and other, possible future conflicts to determine how best to apportion scarce logistics dollars among the competing demands, one of them being the need to provide greater sustainability for Air Force weapon systems.

Notes

[1] Brown, Harold. *Annual Report of the Department of Defense, Fiscal Year 1982*, Washington, D.C., January 16, 1981, pp. 63–80; Weinberger, Caspar W., *Annual Report to the Congress*, Washington, D.C., February 8, 1982, pp. III-1 to III-18.

[2] Weinberger, pp. III-149 to III-159.

[3] Kristol, Irving. "Reconstructing NATO: A New Role for Europe," *Wall Street Journal*, 12 August 1982, p. 8; Steel, Ronald, "Ending the American Protectorate of Europe," *Harper's*, July 1982, pp. 10–11.

[4] Sabrosky, Alan N. "America in NATO: The Conventional Delusion," *Orbis*, Summer 1981, pp. 296–297; Mearshimer, John J., "Maneuver, Mobile Defense, and the NATO Central Front," *International Security*, Winter 1981–1982, pp. 106–107; Kime, Steve F., "Warsaw Pact: Juggernaut or Paper Tiger?" *Air Force*, June 1982. p. 68.

[5] Brown, pp. 63–68.

[6] Weinberger, pp. I-29 to I-31.

[7] Although the Secretary's original statement was classified, it was widely reported in the public press. See, for example, *Aerospace Daily*, 8 June 1982, p. 205; Scheer, Robert, "Pentagon Plan Aims at Victory in Nuclear War," *Los Angeles Times*, 15 August 1982, p. 1.

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Winston Churchill in
The River War, 1899

Logistics as an Interdependent Function in NATO

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"The history of failure in war can be summed up in two words: TOO LATE; too late in comprehending the deadly purpose of a potential enemy; too late in realizing the mortal danger; too late in uniting all possible forces for resistance; too late in standing with one's own friends."

General Douglas MacArthur

Introduction

Coalition warfare has many inherent weaknesses, both political and military. Most, if not all, of these shortcomings can be overcome by increased dedication, commitment, cooperation, and planning. Recently, in observing the functions of NATO, where cooperation is often minimal and coalition planning can be nonexistent, I found the major area of weakness to be in the field of consumer logistics—supply, maintenance, and transportation. The nation which stands to reap the greatest benefit, but which has made the least apparent commitment to creating an interdependent logistics system, is the United States (US). The US must take the lead in this critical area—the potential for success or disaster is obvious. **The US cannot stand alone logistically in Europe.** Neither can she fail to understand the extent of the problem, nor can she continue to deprecate the role of the Allies.

In spite of my skepticism, the nations of NATO have in fact made remarkable strides (albeit not without difficulty) in the cooperative development of weapons systems; compatibility of tactics and doctrine; and interoperability of command, control, and communications (C^3) systems and war plans. Some of NATO's accomplishments which have been significant are shown in Table 1.

The threat posed by the powerful Warsaw Pact forces demands a strong, capable, standing force in Europe to deter aggression and, then, if an attack occurs, to deny it any success. Readiness and capability cannot be gained solely through cooperation in weapons development and procurement, operational war planning, and communications. Optimum combat readiness can only be achieved in NATO through cooperation and integration of all activities. Unfortunately, the logistics activities of supply, maintenance, and transportation have not been pushed toward rationalization, standardization, and interoperability (RSI) within NATO. Historically, these activities have been treated as "national responsibilities." Technology and defense economics now demand that this definition and logic be challenged. The prohibitive costs of fielding a credible conventional force, while also sustaining a formidable nuclear strike force, have required some nations to restrict their NATO commitments and tasking to an unacceptably weak level. The growing need for specialized high technology weapons systems and the restrictive costs of production and maintenance have forced many nations to depend increasingly on others for support. The costs in men, money, and materiel to fulfill all defense readiness tasks prevent any one nation from shouldering the entire burden.

Sharing the load and appreciating interdependence are becoming realities in NATO. All the NATO nations have

- — Weapons Systems:
  - — F–104G Starfighter; Multi-Role Fighter
  - — ATLANTIQUE Maritime Patrol Aircraft
  - — NIKE HERCULES and HAWK Surface-to-Air Missile Systems
  - — NATO Frigate
  - — F–16 Fighting Falcon; Multi-Role Fighter
  - — NATO Airborne Early Warning (NAEW) System; E–3A and NIMROD
- — Tactics and Doctrine:
  - — NATO Nuclear Employment Plans and Strike Operations
  - — NATO Tactical Leadership Program and Tactical Air Meets
  - — Allied Tactical Pamphlets Covering Every Facet of Land, Sea, and Air Operations
  - — NATO Standardization Agreements — STANAGs
  - — SACEUR's — Second Echelon Interdiction Study and COMAAFCE's Offensive Counter Air Study
  - — Aerial Combat Training — Decimomannu
  - — Exercise Program — WINTEX, ABLE ARCHER, CRESTED EAGLE, REFORGER, COLDFIRE, NORTHERN WEDDING, DAWN PATROL
- — C^3 and War Plans:
  - — NATO Integrated Communication System (NICS)
  - — NATO Satellite Communications
  - — ACE Command and Control Information System (ACCIS)
  - — International/Integrated Command & Control Structure
  - — Target Prioritization System (TPS)
  - — Integrated War Plans

Table 1: NATO Coalition Efforts.

openly expressed a commitment to RSI. The NATO long term defense program (LTDP), approved by the various heads of State during May 1978 in Washington, D.C., now gives clear guidance for cooperative defense planning in eight major areas: readiness, air defense, electronic warfare, maritime posture, C^3, reinforcement, reserve mobilization, and consumer logistics.[1] It is this latter area of consumer logistics which I think needs much more than just bureaucratic attention—it needs *major* national attention.

It has already been demonstrated in several areas that collaboration and cooperation are possible; and, where it has been tried (whether bilaterally or multilaterally), RSI has produced better and less expensive weapons systems. The progress made in the standardization of tactics and doctrine and the integration of C^3 stand as evidence of what can be done due to the will and commitment of the various parties. There are many RSI measures which can be explored, and then taken, to increase the effectiveness and efficiency of consumer logistics operations within the NATO framework. These critical functions can no longer be allowed to remain strictly "national responsibilities."

While *total* integration and standardization of logistics within NATO would be an ideal long-term goal, I am actually advocating the acceptance of interdependence and cooperation on a lesser scale in the short term. Hopefully, the formalization of cooperative logistics functions will later lead to increased readiness and improved combat effectiveness. There is too much at stake to continue working in a patchwork quilt manner. Above all, NATO commanders, who have operational command authority for assigned forces in wartime, now must be given the authority and capability to command and coordinate logistics support.

The Way Ahead

Elimination of National/Parochial Constraints. Very simply stated, the members of the Alliance must overcome the constraints of national economic self-interest and cynicism which have perpetuated the rationale that logistics in NATO is a "national responsibility." The reluctance to pool resources in the past has been attributed to the presumption that less productive nations will rely upon the richer nations to fill the pool rather than accept a fair contribution.[2] It is high time that such assumptions be eliminated completely from NATO. Sharing and pooling resources must take place in the heat of battle—it does not take place in NATO exercises today. The sooner we develop a realistic plan for the interdependence of logistics, the better the total NATO force will be prepared.

The Need To Work on Constraints

NATO has been hampered since its inception by the lack of qualified logisticians and the absence of an effective infrastructure for coordinating logistics needs. The appointment of an assistant secretary general for infrastructure and logistics at NATO headquarters and the establishment of a multinational logistics coordination center at the Allied Forces Central (AFCENT) Europe headquarters point the way to building the required organization. Full implementation of the LTDP will provide the logistics planning expertise still needed.[3] In the meantime, there are hundreds of logisticians in NATO headquarters whose talents are being wasted. These people at the primary subordinate command (PSC) and major subordinate command (MSC) level have duties and responsibilities which are now only monitoring and advisory in nature. Their role could easily be expanded to include planning, coordinating, and listing consumer logistics requirements.

Initial Steps

Supply and Maintenance. The ideal situation would be to have a single system of supply and logistics for NATO. The next best thing is the NATO Maintenance and Supply Agency (NAMSA). Formed in 1958, NAMSA's mission "is to support weapon and equipment systems, which several NATO nations are using, with the objective of maximum effectiveness and minimum costs to all participating NATO nations."[4] Five missile systems (NIKE, HAWK, LANCE, TOW, and SIDEWINDER), air defense radar, communications equipment, the F–104G, CL89 Drone, FH–70 Howitzer, various torpedoes, and crypto equipment all fall under NAMSA's purview. The SP–70 self-propelled Howitzer, MAVERICK missile, OTO MALERA 76–mm gun, MARK 46 torpedo, and AWACS/NAEW are also being considered for inclusion in its support. Specific tasks which NAMSA now performs are consolidating spare parts requirements, procuring and stocking parts, maintaining and repairing equipment, procuring materiel and services, providing technical assistance, and transporting materiel.[5]

Thirteen years ago, the very existence of NAMSA was in doubt. Today, it is a thriving organization, saving NATO hundreds of millions of dollars. One example of large savings was in the procurement of aircraft tip tanks. Country A required five tanks at a unit price of Deutsche mark (DM) 18,000 (approximately $9,000). NAMSA was able to consolidate the requirements of three more countries into a total order for 95 tanks. As a result, the unit price was dropped to DM 11,499 which gave a total savings of DM 600,000 (approximately $300,000). Some individual spare part purchases by NAMSA have resulted in as much as a 50% cost reduction. The consolidation of LANCE and TOW missile repair and overhaul workshops for instance has resulted in a savings of $20 million.[6]

NAMSA's efficiency and cost-effectiveness have been clearly demonstrated. Quick delivery times and accurate cost measurement policies are evidence of NAMSA's viability as an economical and effective NATO logistics system.

There is, however, one serious deficiency affecting NAMSA's performance. Every NATO nation (excluding Iceland) uses NAMSA support except the United States. The full participation of the US Army, Navy, and Air Force would enable NAMSA to achieve efficiencies and economies on a much larger scale than is presently realized.

In addition, the scope of NAMSA operations should include all common consumer items such as tires, batteries, lights, rations, clothing, and munitions. A survey of national equipments and requirements for commonality would allow centralization by NAMSA.

Transportation. The only collective effort in the field of transportation within the Alliance is the NATO pipeline. Although this has been a commendable achievement, much more needs to be done to ensure that men and supplies are moved promptly in combat.

No NATO commander has command or control of transportation resources. Requests to move troops or materiel must be forwarded to specific national agencies. It has been demonstrated time and time again in exercises that this makeshift procedure does not work.

Each NATO nation possesses rail, road, air, and sea transport resources. There is a serious need for some coordinating agency to optimize use of these transportation means. It certainly would be criminal to let them sit idle in war while supplies or troops need to be moved.

One way in which transport resources could be better used is by creating a NATO Pony Express. Each nation would be tasked to contribute aircraft (C–130s, F–27s, DO–28s, HH–53s, UH–1s, PUMAs, "nationalized" private aircraft), vehicles (cargo trucks, POL trucks, ammo carriers), boats, ships, ferries, and trains. Once formed, the Pony Express units would be CHOPPED to NATO MSC or PSC commanders much the same as tactical units are given by transfer of authority.

Standardization. The charter of the Military Agency for Standardization (MAS) needs to be expanded. One of NATO's oldest agencies, MAS is one of the primary means of providing military input into weapons projects, programs, and operations. The focus of effort is presently on standardizing complete weapons systems. If single weapons systems cannot be agreed upon for development and procurement, more emphasis should be placed on interoperability, compatibility, and interchangeability. Standardization agreements on common components for various families of weapons should be pursued with the goal that a maximum number of systems would have interchangeable parts such as engines, transmissions, guns, radars, or even light bulbs.

Host Nation Support. The recent US/Federal Republic of Germany (FRG) agreement which requires 90,000 FRG reservists to furnish logistical support to US rapid reaction forces is an excellent example of the type of initiatives which should be continued to expand host nation support in NATO. Any move which reduces the need to transport men or materiel from the US to Europe will decrease overall mobilization efforts. Maximum advantage should be taken of capabilities which can be provided by the host nation, in addition to housekeeping of bases, administration of port facilities, security, and transportation.

Stumbling Blocks

Dr. Alexander H. Cornell, former professor of Management at the Naval War College and NATO Fellow 1979-1980, has produced a very detailed list of arguments for and against collaboration in NATO.[7] Many of these arguments are applicable in attempts to develop an integrated or cooperative logistics system. The major ones are:

Political. Prevailing attitude that sovereignty and pride must be sacrificed to achieve collective security will be a factor. National customs, pride, and the "not-invented-here syndrome" may continue to cause resistance to collaborative efforts. Nationalism and striving for independence naturally produce an attitude of resistance toward accepting interdependence.

Economic. Fear of loss of contracts, sales, and the subsequent effects on national employment figures will have an impact. Cost-effectiveness and national efficiency will no doubt be touted as strong arguments against an interdependent logistics system.

Military. Parochialism and resistance to change will be factors as well as the ever-present interservice rivalries. Fears about losing control of "national resources" will also be present. A critical problem to be anticipated is the general unfamiliarity and lack of knowledge within the US military of most NATO organizations, policies, and procedures.

Solutions

Most, if not all, of the problems cited above can be solved. Many of them, and even more complex problems, have been dealt with successfully in the collaborative development and production of weapons systems. We need to examine those problems from political, economic, and military standpoints.

Political. Some limited amount of sovereignty and xenophobic pride may have to be sacrificed in any coalition effort. The goals of survival and security have to be weighed against those sacrifices. A rational decision maker should not let national custom or the "not-invented-here syndrome" inhibit choices of appropriate alternatives.

Economic. Consideration of market imperatives should be viewed differently in this context versus the classical economic free market model. It is my belief that competition and cooperation can coexist. The theories and rules of cost-effectiveness and efficiency can be applicable if used properly. We have learned our lesson well in overstressing these principles in the past.

Military. The creation of a more open-minded environment in the military will be beneficial to more than just the subject at hand. Education, training, and exposure to NATO and other services must be stressed increasingly in the professional development of every US military officer.

The Benefits

There are two broad categories of benefits which can be gained from the formation of an integrated logistics system. They are in economic and combat efficiency.

Economic. Economy of effort could result from savings in manpower, time, and money. By combining logistical support functions, duplication and waste of manpower could be reduced or even eliminated. Fewer people would then be needed to gather, handle, and move supplies. In the Central Region alone, the administrative overhead associated with seven separate national logistics systems could be reduced. Time savings would result from the decreased effort in the search for and delivery of supplies if parts and transportation systems were centrally managed. One study conducted, using 1968 levels of expenditure, showed that within Europe alone the possibility existed to save 8½% of the total NATO logistics bill per year. That would have resulted in a savings of about $500 million in supplies and $200 million in operating costs.[8]

Economy of scale could be achieved in consolidated buying. The savings in this area are limited only to the extent nations agree with, and conform to, the goals of RSI. The examples already demonstrated by NAMSA procurement successes should be incentive enough to any nation.

Economies in preparation would result if the system were established in peacetime and brought under the auspices of the NATO commander. He would then know what shortfalls existed and could take action to either correct the situation or plan around it. Under current conditions, the operational commanders know only in broad terms the logistics status of forces being assigned.

Combat Efficiency. Imagine the circumstances under which nations fighting side by side need to share ammunition, fuel, transportation, or maintenance assets. Cross servicing and movement of forces between commands are presently very difficult. In short, the lack of a common logistics system hinders the flexibility of the field commander to employ forces. General Andrew Goodpaster, former Supreme Allied Commander Europe, has pointed out that "the absence of an area logistic system to enable ground forces to be used with adequate freedom of action contributes to an estimated loss of effectiveness of at least 30%, and in some forces 50% or more."[9]

Summary

It is clearly in the best interests of the US to pursue an interdependent logistics system in NATO as a long-term goal. In the short term we should attempt to develop a cooperative logistics system and continue to press for achievement of NATO LTDP's aims. The US should take the lead in seeking these goals: A good place to start would be the participation of the US Army, Navy, and Air Force in NAMSA to the maximum extent possible. Further collective efforts in the field of transportation must be made to provide NATO commanders the means to move men and equipment without having to rely on "national resources" and falling victim to "national priorities." The formation of a NATO "Pony Express," consisting of multinational transportation resources under the command of MSC and PSC commanders, would be a major improvement.

The logic that logistics in NATO is a "national responsibility" is no longer valid. Attitudes and opinions must accommodate the reality of the situation. Cooperation is the key to survival. This change in mind-set must come from every sector involved in the formulation of policy and strategy, and planning, programming, and budgeting. The Executive Department, Secretary of Defense staff, Congress, and the military services must embrace and support the NATO plans and concepts which we have helped to articulate and to which we have given our agreement.

Achievements in the collaborative development and production of weapons systems, compatibility of tactics and doctrine, and interoperability of command, control, and communications systems and war plans stand as examples of what can be achieved in NATO given the will and commitment. In spite of warnings by Clausewitz and Scharnhorst about the inherent weaknesses and deficiencies in coalition efforts, NATO has overcome nearly all of those shortcomings and has survived through three decades of political, economic, social, and military turmoil. But, NATO is far from perfect, and much needs to be done. When Major General Richard C. Bowman, USAF, former military advisor to NATO Ambassadors Donald Rumsfeld and David Bruce, retired in 1982, he cited several deficiencies in NATO. Among those was the tendency to forget that we are committed to fight together.[10] This dangerous attitude of some planners to think that any NATO nation might "go it alone" has permeated nearly every facet of operations. It seems to be most apparent in the area of logistics. The rationale that logistics in NATO is a "national responsibility" has been a constraint on developing a cooperative or integrated logistics system for too long. The interdependency which NATO nations have accepted in many areas must be dealt with in logistics.

If NATO commanders are to have complete responsibility and flexibility in the employment of their assigned forces, they must have the authority and capability to command and coordinate logistics support for those forces.

NATO will be what the member nations of NATO want it to be. The approval of the long term defense program demonstrates its resolve to achieve the goals of rationalization, standardization, and interoperability. The need to continue the progress of these measures is essential—before it is TOO LATE.

Notes

[1]Cornell, Alexander H. *International Collaboration in Weapons and Equipment Development and Production by the NATO Allies: Ten Years Later - and Beyond* (The Hague: Martinus Nijhoff Publisher, 1981), p. 53.

[2]Heiser, Joseph M., Jr., Lt Gen, USA (Ret). "The Long-Term Defence Programme: Crucial to Credible Deterrence," *Defense Management Journal*, July-August 1979, p. 4.

[3]Ibid., pp. 5-6.

[4]Spaulding, Harry S. "NAMSA, The NATO Maintenance and Supply Agency - Its Role in International Logistics," *NATO's Fifteen Nations*, December 1979-January 1980, p. 57.

[5]Ibid., pp. 57-60.

[6]Ibid.

[7]Cornell, pp. 71-94.

[8]Goodpaster, Andrew. "NATO Strategy and Requirements 1975-1985," *Survival*, September-October 1975, p. 212.

[9]Ibid.

[10] Schemmer, Benjamin F. "A Growing Anti-Alliance Attitude Threatens Free World Defense," *Armed Forces Journal International*, February 1982, p. 74.

Item of Interest

SOLE Announces Award

The Society of Logistics Engineers (SOLE), acknowledging the need to broaden writing skills early in professional career development, has announced an annual award for the best *AFJL* article written by a junior officer.

Articles considered for this award must have been written by lieutenants or captains and have been published in the *Air Force Journal of Logistics* during the previous fiscal year. The selection for FY83 will be made by the executive board of the SOLE Chapter, Montgomery, Alabama, and announced in our Winter issue. The winning author will receive a special, framed certificate and a one-year membership in SOLE.

USAF LOGISTICS POLICY INSIGHT

Stock Level Initiatives

During the past two years, major programs have been initiated to improve the availability of spare parts at the user level. The methods for determining field level stockage of AFLC recoverable and field level consumable items were changed and implemented in late FY82. The changes improve the capability for ensuring availability of spare parts at the point of need by predicting failures before they occur and placing greater emphasis on stockage of mission limiting items. Major changes to the stockage policy for field level recoverable repair parts are programmed for testing and implementation in early FY84. The goal of the stockage improvement efforts is to improve mission support by ensuring the right part is in the right place at the right time. Accomplishment of the goal will continue to be pursued through innovative techniques designed to improve the expenditure of available dollars and distribution of available assets. Improvements have already been accomplished in the areas implemented in FY82, and we are looking forward to further improvements through additional initiatives.

Azores Delivery Costs

Action is underway by the Air Force to expand and enhance the current method of ocean delivery to the Azores. This action was initiated by the Air Force Commissary Service (AFCOMS) request for refrigerated (REEFER) container service to replace the breakbulk method of shipment for freeze and chill commissary items. Historically, the Air Force's desire to provide reefer service to the Azores has been severely constrained by excessive cost. Cost to the Air Force is twice the rate ($458 per measurement ton) charged for container service to other overseas locations. Air Force and Headquarters Military Traffic Management Command performed a cost analysis of several transportation alternatives which could provide the desired service at a reduced cost. By weighing cost against service, it was determined that the dedicated service contract for full container service would be the most acceptable option. On 31 May 1983, the Air Force decided to have the Military Sealift Command arrange for dedicated contract service to the Azores. The contract will be for a minimum period of two years beginning 1 Oct 83.

Manufacturing Needs Policy

The Air Staff just revised AFR 800-9, *Manufacturing Management Policy for Air Force Contracts,* to emphasize weapon system production and production support from the start of the acquisition phase through the end of the logistics life cycle. The key area is planning in advance for manufacturing needs instead of waiting for the production phase and post-production support. As a follow-on to this revision, AFR 78-13, *Industrial Preparedness Planning,* is being changed to relate USAF needs and planning capabilities to current OSD initiatives concerning the industrial base. The new regulation will be geared toward industrial responsiveness, productivity, and preparedness via an integrated problem-solving and a strategic investment approach. Both regulations point out the need for renewed, long-term visibility into the industrial manufacturing process as a deterrent to war.

Spare Parts Disbursement

The Air Staff has initiated a new procedure for disbursing resources to AFLC for the procurement of aircraft replenishment spare parts. Historically, funds have been allocated to AFLC in a single procurement authorization line to procure necessary replenishment spares. In a major policy change, HQ USAF is now allocating aircraft replenishment spares funds to AFLC by "weapon system." This new procedure will ensure that the aircraft replenishment spares program is executed as intended by the corporate Air Force. The Air Staff-approved allocations, which are based on weapon system priority and need, will help ensure maximum capability from limited spares resources.

Program Director Guidance

The Air Staff just completed and published the new Headquarters Operating Instruction 800-2, *Program Management Direction*. This HOI provides program officers with instructions on information that should be included in their program direction to the developing and supporting commands when a weapon system is being developed or modified. The new HOI requires specific statements of required logistics support, reliability, and maintainability. MAJCOM Headquarters having responsibility for new weapon system development should obtain a copy for review and information.

Space Logistics

Two space logistics documents have recently been published. The Air Force Space Plan is a comprehensive review of where we are in the space arena and where we should direct our energy in the next decade. The Air Force Space Logistics Concept Study identified several initiatives which, when implemented, will substantially increase the readiness and supportability of our space systems as we integrate them into the operational Air Force. The future of the Air Force space effort will involve AFLC and all of the traditional logistics functions so vital today in making our weapon systems supportable. (Major Sawaya, AF/LEYE, AUTOVON 227-9179)

Capital Investment

The Air Force is hosting the second annual DOD Depot Maintenance Seminar at Warner Robins Air Logistics Center, Robins AFB, Georgia, 18–20 October 1983. The Seminar theme will be "Capital Investment Programs." The objective of the seminar is to promote interaction between the Services and to seek common solutions to management issues in capital investment. Issues include the use of industrial funds to purchase equipment, technology exchange and transition to investment programs, and composite repair technology. HQ AFLC/MAX will publish seminar proceedings in November 1983.

Logistics in Exercises

With a goal of increasing both the scope and realism of logistics play in JCS-sponsored exercises, HQ USAF DCS/Logistics and Engineering has formed an Exercise Steering Group. The Group oversees and coordinates logistics exercise planning among the Air Staff and the MAJCOM logistics exercise planners. While the AF Combat Logistics Division (AFCOS/LERX) is leading the planning effort, success in achieving logistics realism depends upon the magnitude of the involvement of the logistics community.

DITY Moving Program

The Do It Yourself (DITY) moving program continues to be a popular method of transporting household goods. The following are a few statistics covering moves made in FY82: Total number of moves reported was 25,617 which included 7,395 local (cross-town) and 4,610 made in privately owned or borrowed trucks and trailers. The average shipment weighed 3,325 pounds, producing a constructive cost of $738. The average DITY move (rental charge/truck operating allowances) cost $203 and produced an incentive payment of $384 with a savings to the government of $151. From a policy viewpoint, DITY moves offer the member the needed flexibility and control.

SATO Service Expanded

The DOD policy for establishment of commercial ticket offices has been broadened so all CONUS Air Force Bases have access to the services of a Scheduled Airline Traffic Office (SATO). Bases generating insufficient revenue to qualify for a full SATO are connected to another base's established SATO via telephone and teleticketing equipment. Sixty-two SATOs and thirty-three satellite activities are on-line in the US, with four more operating in the Pacific Theater. A program is underway to evaluate the feasibility of emplacing SATOs in Europe.

Motivation of Staff Officers in the Continental Army (1775-1783)

Staff officers who served in the Continental Army from 1775 to 1783 were truly a unique breed. By 1780, people had practically forgotten that a war was still being fought, but these officers remained dedicated, patriotic, and honest. What motivated these men to join the army, and why did they continue to serve despite economic and psychological hardship? The mere assertion that staff officers were motivated by patriotism or concern for personal honor seems questionable to us today. However, by reading the words of these officers, which were often written in private correspondence or during battles, we can gain a personal insight into why Americans participated in the Revolutionary War.

Men originally joined the staff department for different reasons—to make money, to preserve their liberty, and to serve their country. As the war progressed, however, **economic** incentives and the **fear of enslavement** lessened in importance, while **patriotism** and **honor** remained strong. This patriotism was also supported by a deep sense of **loyalty** to the staff departments and to other officers.

A strong motivation for joining the staff department of the Continental Army was the desire for **economic** gains. At the beginning of the war, it was common knowledge, especially among merchants and those involved in trade and commerce, that serving one's country could also be profitable. However, the question of making a profit had little influence on the decision of high-ranking staff officers to accept an office. Economic self-interest was much more evident among deputies and assistants who believed that fortunes could be acquired while serving in the quartermaster and commissary departments.

Once in office, however, these officers were soon without any hope of monetary reward. Added to this demoralization factor was the disorganization and related problems caused by the nation's chaotic finances (lack of money to purchase supplies; debts, lawsuits, and the loss of prestige). Even though many staff officers refused to serve under these adverse conditions and resigned, many others stayed long after they had just reason to leave.

Although these men rarely expressed a **fear of being enslaved** when explaining why they had joined, they, along with a host of other Americans, probably joined the Continental Army believing that "nothing less than a deliberate assault launched surreptitiously by plotters against liberty" had commenced with the opening of hostilities on Lexington Green.[1]

The **patriotism** of staff officers was expressed in three distinct but overlapping ways: *serving their country; serving the Commander-in-Chief, George Washington; and preserving the army and its reputation.*

Throughout the war, patriotism remained a strong motivator. These officers frequently used the patriotic appeal of *serving one's country* to encourage their men to greater effort and to settle disputes and maintain harmony between officers.

Top officials also resorted to this type of appeal to dissuade subordinates from quitting the service. On one occasion, Deputy Quartermaster Udny Hay appealed to them "in the name of your *yet bleeding Country*" to remain at their posts.[2]

Amongst the ideals of this group of men, the army shared a place of honor with serving one's country; American independence depended on the army. If the army was defeated, the means by which life, liberty, and property were to be defended would also be lost.

A sense of *personal responsibility to George Washington,* as well as to the army and American independence, also motivated staff officers. Their love and esteem for Washington often reveals the extraordinary reaction that his force of character and symbolic role produced. When these officers failed to live up to Washington's expectations, anxiety and guilt consumed them; to disappoint him was to fail the cause of American independence.

By far the most powerful value motivating these officers, however, was an *inner desire to preserve, defend, and add luster to their reputation and the honor of their respective departments.* Without a good reputation, a man could not seek a public office or a place of influence in the community, nor could he maintain commercial connections for very long. For Nathanael Greene and other staff officers, to preserve and add to their reputation typified their highest aspiration in the war. Also, the reputation of individuals could not be separated from the reputation of the department. The desire to bring **honor** to the department inspired these men to perform conscientiously and to comply with orders and regulations. If they did not, they were rebuked by others for disgracing the department.

A strong sense of **loyalty** towards one another also emerged among these officers during the hardest days of the war. The day-to-day routine—supplying the army and caring for its sick and wounded—provided them with a common goal whose success rested upon their cooperation, energy, and dedication. From these occurrences, often strengthened by crisis, arose a respect for each other. Superiors praised them for their accomplishments which in turn established a special rapport between the superior and the subordinate.

"For one rare moment in American history, among at least one group of men, self-interest was not at war with the common good; instead serving the public promoted and enhanced the self. By steadfastly doing their duty—purchasing food, transporting camp equipment, and tending the sick and wounded—staff officers brought honor to themselves, to the staff departments, and in retrospect, to the cause of American independence."[3]

These values—patriotism, loyalty, and most of all honor and reputation—provide the key to understanding the willingness of staff officers to undergo the hardship and strain of public service.

Notes

[1]Bailyn, Bernard. *Ideological Origins*, p. 95.
[2]Udny Hay to the Asst Deputy Quartermasters, 6 Oct 1779, Nathanael Greene Papers, APS.
[3]Carp, E. Wayne. *"To Starve the Army at Pleasure": Continental Army Administration and American Political Culture, 1775-1783* (University of North Carolina Press).

Condensed from Chapter 6, "Motivation of Staff Officers," in the book, *'To Starve the Army at Pleasure': Continental Army Administration and American Political Culture, 1775-1783* (University of North Carolina Press, forthcoming), by E. Wayne Carp.

DMES: A Micro Application With a Macro Payback

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Introduction

One of the most frustrating tasks in mobility operations is aircraft load planning—determining how to move the required cargo in the right sequence in the fewest number of airplanes. The current manual methods are time-consuming, error prone, and somewhat inefficient. The load planner, using a diagram of the cargo floor and plastic templates, must juggle up to seven different constraints to produce a load plan that does not violate the various aircraft restrictions. Even if load plans are prepared correctly, changes in aircraft flow, cargo priorities and availability, and taskings can result in last-minute chaos. The Air Force Logistics Management Center (AFLMC) has developed the Deployable Mobility Execution System (DMES) to address these problems. The intent of this article is to give the reader some background on the development of DMES, a short description of the system, our test results, and the plans for future implementation.

Background

In March 1981, the AFLMC was asked to evaluate a software package for aircraft load planning developed by two members of the New Mexico Air National Guard. Our evaluation showed that, while this particular package would not totally satisfy the requirement, it did demonstrate the feasibility of using computers in the load planning process. Also, at that time, the Air Force Data Systems Design Center (AFDSDC) began initial work on an automated load planner which would be included in the Contingency Operations Mobility Planning and Execution System (COMPES). As a result of the interest generated, the AFLMC began work on a prototype software package for the Honeywell 6060 system.

Although the Honeywell package was intended to be a research tool to investigate load planning algorithms, it was successful enough to be actually used for some limited tests. The software was demonstrated to various groups throughout the fall of 1981 and generated a great deal of interest. In January 1982, the system was briefed to the AFLMC's Board of Advisors (BOA). At that time, the BOA directed the AFLMC to build a prototype load planning system on a deployable microcomputer and to complete the work in 1 year.

After doing some preliminary work based on the Honeywell software, the Hewlett-Packard (HP) 9836A microcomputer was chosen as the target hardware for the prototype. While waiting for delivery of the equipment, more research on load planning was done and a more powerful software design was completed. The HP system arrived in July 1982 and development started immediately. The first complete version of DMES was demonstrated to the Military Airlift Command Affiliation Manager's Conference in November 1982. Receiving enthusiastic support, DMES was then demonstrated to many groups, which included most USAF major commands, HQ USAF, the Joint Deployment Agency, and the Army, Navy, and Marine Corps. The system was tested and improved throughout the spring of 1983 and has undergone two major revisions.

> *"How do we provide the expertise of a loadmaster to the units without taking away their ability to explore alternatives?"*

What is DMES?

As mentioned in the introduction, aircraft load planning is very time-consuming (see reference 1:22 for an excellent discussion of the problem). An expert loadmaster can produce a complete load plan for a C-130 or C-141 in 20–30 minutes and a load plan for a C-5 in 1 hour. A unit load planner who has the job as an additional duty is normally much slower and cannot produce loads as efficiently. However, the unit must be represented in the process to ensure that its forces are deployed in the correct sequence. The question in the DMES design was: How do we provide the expertise of a loadmaster to the units without taking away their ability to explore alternatives?

The answer was to build a computer-assisted, instead of an automated, system. That way, the machine could do the dogwork (which causes the most problems for unit planners) and free humans to use their judgment. Much of the loadmaster's knowledge of aircraft loading techniques and airframe constraints could be built into the system so the programs could make various checks and catch any errors. This approach also had other advantages. Since the software needs someone to guide it, it is not merely a "black box" which does things by itself. The control a user can exercise helps acceptance of the system tremendously. Also, since it is an assisted system, a user can override anything the software does with a load plan and adjust it as necessary. The software is based on manual methods, so the menus and question-and-answer sequences it employs look familiar to those who perform planning by hand. This has tended to decrease learning time for the system. Finally, use of an assisted system ensures that the unit planners must still know enough about load planning to do it by hand, which would be essential if the machine were not available.

Basically, DMES consists of a small data base management system (DBMS), a load planning package, and an options package. The DBMS allows the user to build files containing data on the equipment deployed and also allows him to save and retrieve load plans. The load planning portion of DMES generates first cut load plans. The user sets up the aircraft type, the cargo to be moved on that load, the load configuration, and the number of passengers to be carried. Given that input, DMES generates a feasible load plan.

The options are really what "sold" DMES. Once the load is generated (a process that usually takes less than 1 second), it is displayed graphically on the microcomputer display. At this point, the user can add, delete, move, or rotate cargo and passengers in any manner desired. DMES gives warnings any time the user violates a particular aircraft constraint and automatically does all the weight and balance calculations. These facilities allow the user to apply his personal expertise in load planning, since he can see ways to position odd-shaped cargo in the aircraft much better than the DMES software can. However, since the first cut load plans eliminate much of the work by giving the user a feasible starting point (or, in most cases, the final solution), the time saved is dramatic.

Once the user is satisfied with a load plan, he can print it (see Figure 1 for a comparison of DMES output and a manual load plan) and save it. All the cargo loaded on that aircraft is tagged by the DBMS so that an item is not loaded on more than one aircraft. DMES currently supports C-130, C-141, and C-5 aircraft, and work is in progress on the KC-10 and B-747 freighters. Since all the data is stored on removable floppy diskettes, there is no limit on how much cargo and how many loads DMES can handle. Each diskette can hold data on 500 pieces of cargo and can store 180 load plans, which would satisfy the needs of the majority of the units which have a mobility requirement. Since the user can save and retrieve load plans, DMES allows development of movement plans for various scenarios which also can be used to provide documentation on cargo and passenger movement.

DMES currently runs on the HP 9836 and HP 9816 microcomputer systems. The software is over 11,000 lines and is written in the Pascal programming language.

Test Results

Tests with DMES in actual deployments have yielded better results than we could have expected. The first version of the system was used in TEAM SPIRIT '83 at Iwakuni MCAS, Japan (Figure 2). In this test, DMES was used in parallel with load plans produced by the USMC embarkation officers to provide a comparison between by-hand and computer-assisted planning. DMES offered a 97% savings in man-hours when determining the C-141 flow and a 14% savings in airlift. Using the current MAC rate for C-141 flying hour costs, over $40,000 could have been saved on the short missions from Japan to Korea if the DMES load plans had been used. The Marines had also planned their flow, using C-130 missions. DMES was able to plan the same flow on 37 sorties, representing a 21% savings.

Next, DMES was used to produce loads for a tactical movement of the 9th Infantry Division (USA) in LASER MACE '83 (Figure 3). For this test, DMES was used to show how much more cargo could be hauled on the same number of missions. Many valuable results came from LASER MACE: the DMES load plans were actually used and the system was validated for use in tactical as well as strategic load planning.

Our most recent test was UNIVERSAL TREK '83, a joint USA-USAF exercise in June 1983. At the time this article was written, the comparisons were not complete. However, DMES saved at least one out of 23 missions and again was responsible for a drastic reduction in man-hours. In UNIVERSAL TREK, DMES load planned all three airlift aircraft with many mixes of cargo and passengers, and performed flawlessly. This exercise was significant because this was the first time DMES was used for a redeployment, which is typically much more difficult to manage and subject to many more changes. It should be mentioned that, in all cases, the load planning was performed by personnel involved in the deployments, not by any member of the DMES project team. We have been very successful in training with DMES; typical times for a user to learn how to use the system have been less than 5 hours.

The results of these exercises have shown the potential of DMES. In just three deployments, we have paid three times over the cost of the entire project. The consequences of a DOD-wide implementation are more dramatic even if just 5% of the airlift is saved using DMES. The current estimate on the number of systems needed to support the immediate DOD requirement is 272. Using the cost of the current system ($8400), the implementation would pay for itself in approximately 90 days. These figures are based on MAC's flying hour costs alone and do not include man-hour savings. There are many other savings that have not even been addressed, such as decreases in late aircraft departures and less aircraft fuel used due to better balanced loads.

Beyond the financial aspects, the implications for increased responsiveness and decrease of the airlift shortfall could have a major impact on war planning at all levels. DMES is impressive when viewed in terms of savings; however, it is much more attractive when evaluated in terms of increased capability. More airlift capacity means more cargo can be moved, which means more war-fighting capability can be supported.

	USMC	DMES
CARGO MOVED (LBS)	1,072,000	1,072,000
PASSENGERS MOVED	497	497
CB-141B SORTIES REQUIRED	21	18
MAN-HOURS TO PRODUCE LOAD PLANS	140	3.5

Figure 2: Comparison of DMES Load Planning Vs. By-Hand Planning for TEAM SPIRIT '83.

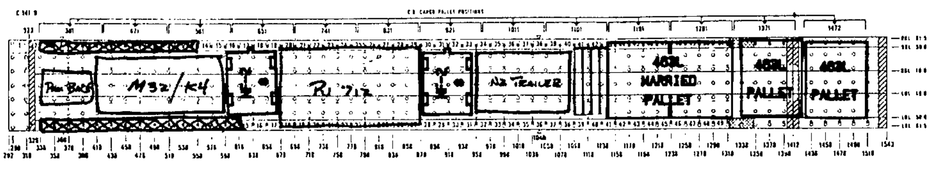
	USA PLANNED	DMES PRODUCED
CARGO MOVED (LBS)	1,584,954	1,768,154
PASSENGERS MOVED	445	545
C-130 SORTIES USED	90	90

Figure 3: Performance of DMES in LASER MACE '83.

1. UNIT BEING AIRLIFTED (Name or Number)	2. UNIT IDENTIFICATION CODE	3. TYPE MOVEMENT PLAN	4. MOVEMENT DATE	5. UNIT AIRCRAFT LOAD NUMBER of	PAGE OF PAGES
6. MISSION NUMBER	7. ACFT SERIAL NO. (Last five)	8. CONFIGURATION	9. DEPARTURE AIRFIELD/ETD	10. DESTINATION AIRFIELD/ETA	

11. ACTUAL LOADOUT

SCALE - ¼" = 3 FEET



CODED RESTRICTIONS/LEGEND
- 10,000 LB TIEDOWN
- 25,000 LB TIEDOWN
- SEAT STANCHION
- VENT
- SINGLE/DOUBLE SEATS
- NO FLOOR LOADED CARGO
- NO AXLE LOADS
- NO WHEEL LOADS
- VEHICLE TREADWAY
- CREW REST FACILITY

LOAD SE-QUENCE a.	ITEM MODEL AND NOMENCLATURE/DESCRIPTION b.	VEHICLE PACKAGE NUMBER c.	SERIAL INCREMENT NUMBER d.	e. REMARKS: RMKS CODE (From Column i) (1)	OTHER (2)	f. PLANNED LOAD DATA: LENGTH	WIDTH	HEIGHT	WEIGHT (Total Pounds)	g. ACTUAL LOAD DATA: HEIGHT (Total Inches)	CUBE	WEIGHT (Total Pounds)	CENTER OF BALANCE	FUSELAGE STATION h.
1	F/L CARGO		—			50	60	40	4500				25	381
2	M32 TRAILER		TI 48			180	72	76	5450				44	463
3	NF2		TI 45	7A, 6		83	68	60	2150				34	637
4	PU 712 GEN		TI 49			188	100	79	7900				69	751
5	NF2		TI 50	7A, 6		83	68	60	2150				34	908
6	500 GAL N2 TRLR		TI 44	9, 6		123	89	81	8550				65	1017
7	NMF VAN ON DBL PALLET		TI 51			245	108	96	10700				120	1200
8	463L PALLET		TI 47			88	108	60	5000				44	1371
9	463L PALLET		TI 46			88	108	60	5000				44	1472
					TOTAL									943

REMARKS CODES (For use in Column "e(1)")
1. Off center: 1A. RIGHT 1B. LEFT
2. Center line load, seats required both sides.
3. Shoring required: 3A. PARKING 3B. ROLLING 3C. SLEEPER 3D. BRIDGE
4. Must be driven into aircraft in direction of arrow.
5. Sequence pallets IAW actual weights.
6. DD Form 1387-2 required.
7. Maximum fuel: 7A. 3/4 TANK 7B. 1/2 TANK 7C. 1/4 TANK
8. Equipment drained or purged: 8A. DRAINED 8B. PURGED
9. Vent kit required.
OTHER CONDITIONS: Identify in column e(2).

12. PASSENGER SEATS a. PLANNING DATA: MAXIMUM NO. SEATS AVAIL	AVG WEIGHT (Lbs. each)	TOTAL PLANNED WEIGHT	b. ACTUAL DATA: NUMBER SEATS USED	TOTAL WEIGHT (Pounds)	13. DATE APPROVED	14. TYPED OR PRINTED NAME, GRADE AND ORGANIZATION OF PLANNING OFFICIAL	15. SIGNATURE OF PLANNING OFFICIAL
25	180	4500				YOST, KIRK A 1LT AFLMC/LGY	[signature]

MAC FORM APR 80 559

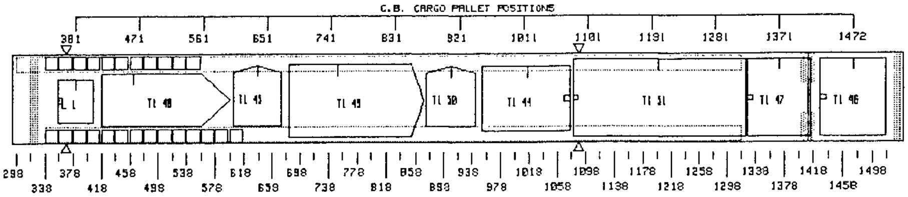
C-141B PASSENGER/CARGO MANIFEST

1. UNIT BEING AIRLIFTED	2. UNIT IDENTIFICATION CODE	3. TYPE MOVEMENT PLAN	4. MOVEMENT DATE	5. UNIT AIRCRAFT LOAD NUMBER of	PAGE OF PAGES
6. MISSION #	7. ACFT SERIAL NO. (Last five)	8. CONFIGURATION	9. DEPARTURE AIRFIELD/ETD	10. DESTINATION AIRFIELD/ETA	

11. ACTUAL LOADOUT

SCALE - 1/4"=3 FEET

C.B. CARGO PALLET POSITIONS



	DATE CERTIFIED	PRINTED NAME, GRADE, ORGANIZATION OF PLANNING OFFICIAL	SIGNATURE OF PLANNING OFFICIAL
15a. PLANNED LOAD CERTIFICATION	23 NOV 83	YOST, KIRK A. 1LT AFLMC/LGY	[signature]
15b. ACTUAL LOAD CERTIFICATION	DATE CERTIFIED	PRINTED NAME, GRADE, ORGANIZATION OF LOAD DATA VALIDATOR	SIGNATURE OF LOAD DATA VALIDATOR

SEQ #	INC #		NOMENCLATURE	L	W	H	WGT	CB	STA	SHORING	FUEL	VENT	-2 REQ'D	DATA	BUMPER #
1.	FL	1	F/L CARGO	50	60	40	2000	25	381					planned	
2.	T1	48	A/M32 K4A TRAILER	180	72	76	5450	44	463					planned	
3.	T1	45	NF2 LIGHTALL	83	68	60	2150	34	637		3/4 TANK		18	planned	
4.	T1	49	PU 712 GENERATOR	188	100	79	7900	69	751					planned	
5.	T1	50	NF2 LIGHTALL	83	68	60	2150	34	908		3/4 TANK		18	planned	
6.	T1	44	500 GAL N2 TRAILER	123	89	81	8550	65	1017			YES	21	planned	
7.	T1	51	NMF VAN	245	108	96	10700	120	1200					planned	
8.	T1	47	PALLET 463L	88	108	60	5000	44	1371					planned	
9.	T1	46	PALLET 463L	88	108	60	5000	44	1472					planned	

REMARKS (heading over SHORING, FUEL, VENT, -2 REQ'D)

TOTAL # OF PAX = 25
WEIGHT/PAX = 180
TOTAL PAX WEIGHT = 4500
TOTAL CARGO WEIGHT = 48900
TOTAL LOAD WEIGHT = 53400 ACL = 64000 % ACL = 83.44
% FLOOR SPACE USED = 74.95
LOAD C-B = 943 C-B in the allowable window

LOAD PRINTED AT 8:45 ON 6/23/83

Figure 1: Comparison of DMES Output and Manual Load Plan.

Plans for the Future

The current thrust in the AFLMC is to get DMES implemented at the unit level as quickly as possible. MAC, as the single manager of airlift for the DOD, has recommended that DMES be the sole standard deployable load planning system. Both the Marine Corps and the Navy have adopted DMES and are interested in finding a way to provide it to the field by FY84. All USAF major commands which have mobility taskings are supporting DMES and are working with MAC on fielding the system. At the time this article was written, alternatives were being pursued at various levels to find out-of-cycle funds for implementation. DMES has been adopted as the load planning software for the AFDSDC's Combat Logistics System (CLS) initiative, which will receive funding starting in FY85. While immediate funding efforts are continuing, the worst case is that DMES will wait until CLS is completed to be made available.

As mentioned before, work is continuing to provide capability to handle more aircraft types in DMES. Also, the project team will be evaluating the conversion of the software to run on machines other than the HP 9800 series systems. The incorporation into CLS will also be an ongoing effort. Several options, such as getting DMES to transfer information for the COMPES data base, are also being investigated.

With DMES, a tremendous capability exists to improve mobility and airlift operations. The system is easy to use and provides a huge payback. We believe that this product, in the words of MAC personnel who have used it, can "revolutionize the way we do business" in load planning.

Reference

1. Huebner, Walter F. "Load Planning, Rapid Mobilization and the Computer," *Air Force Journal of Logistics*, 1:22-24 (Winter 1982).

Item of Interest

CRAF Update

In the Summer 1983 issue of *AFJL*, we looked closely at the Civil Reserve Air Fleet (CRAF). Three National War College students have closely observed our now deregulated airline industry and examined its potential for bankruptcy. Clearly, the industry is a great deal more volatile. Their executive summary follows:

> This study investigates the adequacy of existing plans to assure continued airlift support to the United States (US) in the event of bankruptcy of a major US airline. During a national emergency, 90% of US passenger airlift and 38% of US cargo airlift will be provided by the civil sector through the Civil Reserve Air Fleet (CRAF). More specifically, the Department of Defense (DOD) has tasked the civil aviation sector for 90% of its intertheater passenger capacity and 100% of its cargo capability. Because these civilian contributions are essential to the successful execution of US mobility plans, and several major carriers are dangerously close to insolvency, contingency plans are required to deal with a major air carrier failure. However, none exist.
>
> Cargo airlift, especially for outsized equipment such as self-propelled howitzers, fighting vehicles, attack helicopters, and support vehicles, is less than adequate to meet early deployment and sustainability requirements. As documented in the Congressionally Mandated Mobility Study, even with CRAF fully generated, intertheater airlift capability needs to be increased by 30 million ton-miles per day to provide an adequate capability for force projection. Because there are no plans to retain the assets of a failed airline in CRAF, bankruptcy would seriously compound the airlift shortfall.
>
> During 1982, the airline industry lost in excess of $1 billion; furloughed more than 22,000 employees; and, more significantly, experienced the failure of Braniff Airways, a contributor to CRAF. Furthermore, several major CRAF contributors are currently in serious economic difficulty. Salient findings of the study are:
>
> (1) There are no contingency plans to ensure continued civil airlift support in the event of bankruptcy by a major US airline.
>
> (2) Responsibility for emergency airlift is fragmented among several federal agencies, diluting the overall effectiveness of airlift management.
>
> (3) Analysis shows that Pan American World Airways, Flying Tigers Line, and World Airways are experiencing financial problems. Pan American is the largest single passenger carrier in CRAF and Flying Tigers the largest cargo carrier, while World also contributes significantly to the freighter fleet. Failure of any would represent a significant loss to CRAF.
>
> (4) Factors leading to airline bankruptcies are generic to the industry and can, over time, affect other major US airlines.
>
> (5) Aircraft of bankrupt airlines may not be available to DOD until resolution of financial arrangements with lending institutions, both foreign and domestic, have been made.
>
> (6) Aircraft placed in dry storage by financial receivers require a minimum of two weeks to become operationally ready, while other aircraft may demand more time. The requirements for CRAF are aircraft availability in 48 hours. Aircraft sold by receivers to foreign carriers and to salvage are, obviously, totally lost to CRAF.
>
> (7) Commercial pilots of bankrupt airlines will become noncurrent and not legal for flight operations after 90 days of flight inactivity.
>
> (8) The foreign infrastructure consisting of ground handling equipment, maintenance and terminal facilities, and personnel will be lost.
>
> (9) There are 142 US wide-bodied aircraft unassigned to CRAF. However, these aircraft are limited to domestic flight operations because of inadequate extended overwater navigation and communications equipment.
>
> The Congress and DOD need to assess the contribution the civil air carriers make to the US Defense effort and assume the responsibility of maintaining this vital resource with subsidy, if necessary, to maintain essential intertheater airlift. In conclusion, the loss of a major air carrier vis-a-vis a Chrylser or a Lockheed should be compared relative to its impact on US defense posture. Can we afford the loss and at what cost?

From: "The Effect of a Major Air Carrier's Failure on the Civil Reserve Air Fleet" by Col Wayne DeLawter, USAFR; Col John F. Phillips, USAF; and Lt Col Richard Vogel, USAFR.

Contracting Out of AFLC Functions

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Introduction

To achieve the President's objectives for improving our national defense posture and reducing the cost of government, the Office of Management and Budget (OMB) and Office of Secretary of Defense (OSD) have levied an aggressive contracting out program on the military departments. Additional conversions will add to the over 80,000 work-years equivalent the Air Force currently has on contract.

The Air Force Logistics Command (AFLC) has been an active participant in the Air Force end of the cost study program. Because it is a civilian intensive command, i.e., approximately 90% civilian which is a third of all Air Force civilians, it will likely be allocated a substantial share of any future contracting out program. Except for a few residual functions, AFLC has already contracted out most of its work loads which were not *essential* to readiness. Additional contracting out may negatively impact mission essential functions, reduce logistical command and control, and decrease wartime surge capability. Therefore, I feel it is imperative that we develop additional contracting out "readiness" exemptions to protect *wholesale* logistics from too great a reliance on the contract sector to perform its wartime functions. In addition, we need to take a new, carefree, yet jaundiced look at government management criteria to ascertain that readiness is being defined as carefully as it should be.

Governing Regulations

Public Law

Public Law 93-365, 10 U.S.C. 138, 5 Aug 74, provides the following criteria for contracting out:

> It is the sense of Congress that the Department of Defense shall use the least costly form of manpower that is consistent with military requirements and other needs of the Department of Defense. Therefore, in developing the annual manpower authorization requests to Congress and in carrying out manpower policies, the Secretary of Defense shall, in particular, consider the advantages of converting from one form of manpower to another (Military, Civilian, or Private Contract) for the performance of a specified job. A full justification of any conversion from one form of manpower to another shall be contained in the annual manpower requirements report to the Congress required by section 138(c)(3) of Title 10, United States Code.

Public Law 96-342, 10 U.S.C. 2304, 8 Sep 80, Section 502, adds further restrictions to contracting out of Department of Defense (DOD) commercial and industrial-type activities (CITA) to private sector contractors. This Public Law specifies that no CITA activity performed by DOD on or after 1 Oct 80 may be converted to contract to circumvent an arbitrary civilian end strength ceiling and unless the Secretary of Defense (SECDEF) sends to Congress "in a timely manner":

(1) A notification of intent to cost compare a function for potential conversion to contract.

(2) A detailed analysis which shows that contractor operation will result in cost savings to the United States government over the life of the contract and a certification that the entire cost comparison analysis is available for review.

(3) A certification that the government costs used in the cost comparison analysis represent the most efficient and cost-effective means of performance by DOD civilian employees.

(4) A report which shows the potential economic impact on employees, locality, and the federal government if more than 50 employees are involved; the impact on military mission; and the amount of the contractor's bid which was accepted and the cost of DOD civilian personnel performance.

PL 96-342 also requires the SECDEF to notify Congress of all functions with more than ten employees, if a decision is made to convert to contract, and submit a written report to Congress by 1 February of each fiscal year which enumerates the extent of contractor performance by DOD functions for the preceding fiscal year. Finally, Section 502 states that the provisions do not apply during war or national emergency declared by the President or Congress.

OMB Circular A-76

OMB Circular A-76, *Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government,* provides policy and procedure to determine if a function should be performed in-house or by contract. The Circular stresses the importance of the private enterprise system and states that the government should not compete. The Circular also provides that, when private performance of commercial or industrial activities is feasible and no overriding factors require in-house performance, a rigorous comparison of contract costs versus in-house costs will be made to determine whether the work will continue to be performed by in-house personnel or converted to a contract operation. The criteria for performing Air Force functions in-house are: (1) national defense, (2) no other satisfactory source, (3) formation of a personal services relationship, (4) disruption and/or delay of an essential program, (5) requirement by treaty, international agreement, or law, and (6) monetary savings. The OMB Circular authorizes the government to operate commercial activities in-house in the interest of national defense, but exemptions to contracting out are limited to activities operated by military personnel for direct combat support, military training and overseas rotation, and depot and intermediate maintenance to the extent that such support is the minimum necessary to meet military emergencies/contingencies.

DODD 4100.15

Department of Defense Directive (DODD) 4100.15, *Commercial and Industrial-Type Activities,* is the DOD implementation directive for OMB Circular A-76. It reiterates the A-76 policy on contracting out, which is to rely on the competitive private sector for the goods and services needed by the government. This policy is emphasized to such an extent that the Directive only lists circumstances under which a DOD CITA may be performed with in-house personnel. The criteria for keeping a DOD CITA function in-house are the six previously listed from the OMB Circular, added to those which are inherently and obviously governmental functions; e.g., discretionary application of governmental authority and monetary transactions and entitlements.

DODI 4100.33

Department of Defense Instruction (DODI) 4100.33, *Operation of Commercial and Industrial-Type Activities,* implements the policies established in DODD 4100.15 and establishes procedures and criteria to be used by DOD to determine whether CITA work loads should be accomplished by contractor-owned contractor-operated (COCO) activities; government-owned contractor-operated (GOCO) activities; or government-owned government-operated (GOGO) activities. It requires DOD components to prepare and maintain an inventory that identifies their individual CITAs and service contracts in excess of $100,000 annually which the component determines could reasonably be performed in-house.

> **"Work loads that do not require military personnel are performed by in-service civilians or by contract personnel. . . ."**

AFR 26-1

Air Force Regulation (AFR) 26-1, *Manpower Policies and Procedures,* is the Air Force implementer for DODD 4100.15 and is in accordance with 10 U.S.C. 138 which states, "It is the sense of Congress that the Department of Defense shall use the least costly form of manpower, consistent with Military requirements and other needs of the Department." The Air Force work load may be accomplished by military personnel, in-service civilian employees, and contract manpower. The type of manpower to be used is determined by the following factors: a sufficient level of military manpower to meet combat and direct combat support requirements; a need to maintain control of the work force with military and in-service civilians; a need to conform to end strength ceilings and avoid personal service contracts; a need to rely on the private sector for goods and services; and a requirement to use the least costly type of civilian manpower where cost is the determining factor. AFR 26-1 stipulates that military personnel will be used in positions which provide direct combat support; positions under contingency or war plans which are indirect combat support tasks in peacetime; and positions which require previous military-type training. Work loads that do not require military personnel are performed by in-service civilians or by contract personnel based on the outcome of cost studies except where in-service civilians are required for indirect combat support of depot and intermediate maintenance surge capabilities, inherent management responsibilities, civil service regulation, and on other occasions.

The Air Force is required to review all CITAs on a routine basis to determine military necessity and cost-effectiveness. The basic review logic is:

(1) If some/all of the tasks must be performed by military personnel and segregation of work is not feasible, CITA should be in-house.

(2) If some/all of the tasks must be performed by in-service civilian personnel and segregation of work is not feasible, CITA should be in-house.

(3) All other work loads should undergo a cost comparison study.

Current Status of Air Force/AFLC Contracting Out

The Air Force currently has the equivalent of at least 80,000 work-years out on contract. Air Force Commercial and Industrial Contract Services (CICS) work-years by functional category on contract in FY82 are shown in Table 1.

> **"I estimate that AFLC actually has over 36,000 work-years on contract."**

Air Force Logistics Command (AFLC) reported 25,615 work-years on contract in the FY82 CICS Report. The total

Functional Categories	*Work-Years*
Social Services (Commissary, MWR, Mortuary)	635
Health Services	165
Intermediate Maintenance (Aircraft, Missiles, Communications and Electronic Equipment, Training Devices, etc.)	2,117
Depot Maintenance (Aircraft, Missiles, Communications and Electronic Equipment, Test Measurement and Diagnostic Equipment, etc.)	21,298
Base Maintenance Contracts	19,827
Research, Development, Test, and Evaluation Support (Management and Support)	3,426
Installation Services (Laundry, Custodial, Refuse, Mess Attendants, Bus, Fire, Guards, Electric, Heat, Water, Sewage)	15,302
Other Non-Manufacturing (Storage, Cataloging, Printing, Audiovisual, Telephone, Aircraft Refueling, Administration)	9,785
Education and Training	532
Automatic Data Processing	2,355
Maintenance and Repair of Real Property	7,876
TOTAL	83,318

Table 1.

includes depot maintenance by contract, contractor logistics support (CLS), interim contractor support (ICS), and other functions such as custodial services, refuse collection, precision measurement equipment labs, fuels management, audiovisual, and grounds maintenance. However, the CICS Report understates the total somewhat because certain contracting efforts are exempt from CICS reporting. Examples of excluded work loads are construction of facilities; engineering services financed by military construction funds; and technical assessments such as systems engineering and contractor engineering technical services. I estimate that AFLC actually has over 36,000 work-years on contract (Table 2).

Functions	*Work-Years*
Depot Maintenance by Contract	25,000
Contractor Logistics Support	900
Interim Contractor Support	1,800
Classified Programs	4,500
Service Engineering/Embedded Software Support	1,500
Other	3,000
TOTAL	36,700

Table 2.

Since AFLC has one-third of all Air Force civilians, it probably will be allocated a substantial share of the 20,000 authorizations to be cost compared by the Air Force between FY83 and FY89. This continual pressure to contract out more and more AFLC functions **is at the foundation of my concern that we are eroding our wholesale logistics base to meet arbitrary contracting out goals.** As can be seen by looking at the list of those previously contracted functions, AFLC has already contracted out its non-readiness work loads and has also extensively contracted out crucial wartime support functions such as depot maintenance.

Potential Problems and Impacts of Further Contracting

Now that the regulations governing contracting out and the extent of past contracting have been examined, I will turn to the potential problems and impacts that additional, extensive contracting out will have on the ability of AFLC to perform its mission. Logistics support places constraints on combat capability. Combat capability cannot be measured without considering logistics support which is necessary to deploy and sustain military operations. Inherent to AFLC's ability to provide adequate logistics support is the necessity for commanding and controlling essential elements of the wholesale logistics system. AFLC needs to provide the *right* item at the *right* time and at the *right* place to perform the required mission.

"AFLC has... also extensively contracted out crucial wartime support functions such as depot maintenance.

Many logistics functions can be performed by any contractor possessing the basic necessary capabilities. For example, some supply functions, such as preservation, packaging, and storage, can be separated and performed by contractors without greatly affecting logistics readiness. However, AFLC must maintain the capability and authority to control acceptance of materiel from vendors, perform quality assurance, and release materiel to users; i.e., Depot Maintenance, tenants, and operational forces.

To ensure that adequate logistics support is available, AFLC needs to have in-house personnel who perform functions that are essential to the success of war or contingency operations; provide direct materiel support to combat forces worldwide; support directly the deployment of military forces in wartime or contingency operations; and are subject to unacceptable risk of disruption under contract performance. These functions must also be maintained without interruption to assure the peacetime readiness and wartime sustainability of the combat forces, and must be under military command and control to assure continuity, flexibility, and responsiveness. Applying these proposed criteria, AFLC's mission essential functions (Distribution, Materiel Management, Procurement Operations, and Depot Maintenance) can and should be exempted from contracting out.

Materiel Management and Procurement Operations are inherently governmental in nature and must stay in-house. To remain effective and retain proper control, any organization, military or otherwise, must perform in-house such assorted functions as computing repair and buy requirements, provisioning, negotiating and awarding contracts, and administering contracts.

"To contract much of the distribution function would jeopardize the logistics process. . . ."

Depot Maintenance is already ostensibly protected from excessive contracting out under OMB Circular A-76. While depot maintenance is considered critical enough to warrant including provisions for a partial in-house capability in OMB Circular A-76, Distribution, the connecting step in the process that places the same materiel in the hands of the users, is not addressed as an exemption. The operational effectiveness of the United States Air Force (USAF) depends upon the interaction of AFLC's Distribution function with the tactical, strategic, and airlift forces. Distribution (supply and transportation) is as vital in transporting required materiel to the operational forces at the right time as is the maintenance function. To contract much of the distribution function would jeopardize the logistics process and the Air Force's ability to perform its mission.

During a contingency, it is a fact that the Distribution work force will be realigned to provide the maximum manpower to support the immediate implementation/execution of contingency operations. Support may also be accelerated by curtailing or eliminating nonessential functions and by shifting personnel to essential mission functions and increasing the man-hours worked. Increased transportation requirements will be generated because of increased operational activity. Expected operational changes will be those arising due to increased volume of higher priority shipments requiring more responsive transportation. Anticipated rapid buildup to support contingency requirements will necessitate an immediate surge capability which will not be available if the Distribution functions are in the hands of contractors.

However, my concern over the narrowness of the current national defense criteria is not a plea for total exemption for all AFLC logistics functions. I propose that new readiness criteria, which can be used on a case-by-case basis to justify keeping specific core logistics and other functions in-house, be added to OMB Circular A-76. These criteria must define and then exempt the capabilities the Air Force needs to plan and execute surge and mobilization requirements. I suggest we consider the following factors when determining whether a function must remain in-house or not:*

(1) **Criticality.** The continuity of essential logistics operations under any contingency must be assured. There are certain logistics activities for which back-up capabilities are not available. If a disruption in a function would reduce readiness in peacetime or delay wartime missions, the function should remain in-house.

(2) **Work load.** A significant increase or rapid fluctuation in work load during wartime requires an organic capability. Little change in activity or even an expected decrease may indicate the activity is suitable for contracting.

(3) **Functions.** A significant difference between the functions performed in peace and war requires an in-house capability because a military commander needs to have direct authority over the work force so that he has the flexibility to reallocate the work force to continually changing work load priorities.

(4) **Responsiveness.** An operational requirement for responsiveness indicates a relationship to readiness. Responsiveness implies timeliness and flexibility. If it can be shown that delays and inflexibility would adversely impact the operational mission, the function should remain in-house.

(5) **Management.** A stronger and clearly delineated exemption is needed for inherently governmental functions such as planning, programming, budgeting, computation of requirements, funds control, inventory control, etc.

Logistics functions other than Depot Maintenance are equally critical for ensuring a ready and controlled source of technical competence and for directing the resources necessary to meet military contingencies. Along with Depot Maintenance, many other AFLC logistics and support functions, such as Distribution, Materiel Management, and Procurement Operations, provide assured peacetime and wartime support to operating forces worldwide. Therefore, these functions, as well as depot and intermediate maintenance, should be exempt from contracting out quotas.

Conclusion

OMB Circular A-76 governs the agencies of the federal government in determining which commercial and industrial-type activities are to be operated in-house and those that should be contracted out to private industry. The original (1967) version of A-76 permitted government operation of commercial or industrial-type activities which ensured mobilization readiness. When A-76 was republished in March 1979, the readiness exemption was deleted. The Circular now limits the "national defense" exemptions to (a) activities operated by military personnel for direct combat support, military training, or overseas rotation, and (b) depot and intermediate maintenance support to the extent that such support is the minimum necessary to maintain a "core capability."

"The potential risks associated with contracting out such mission essential logistics are unacceptable."

Due to the narrowness of the military essential and governmental management exemptions in OMB Circular A-76, the majority of AFLC's functions are subject to cost comparison and to being contracted out. These include indirect combat support and inherently governmental functions such as Distribution, Materiel Management, and Procurement Operations. **The potential risks associated with contracting out such mission essential functions are unacceptable.** Our organic capability and ability to command and control would be seriously limited, and we would be unable to reconstitute functions if the contract were disrupted. In addition, contracts are subject to periodic resolicitation which could result in turmoil and disruption. The lack of in-house capability could seriously impact wartime sustainability, because a military commander would not then have direct military authority over contractor personnel nor would he have the flexibility to reallocate contractor personnel to higher priority work loads.

To alleviate these concerns, AFLC needs to maintain in-house personnel who would provide a ready and controllable source of technical competence and resources. This in-house cadre is necessary when flexibility and military command and control are essential, for functions expected to have sizable surges in wartime or contingencies, and for functions providing essential logistics support to the combat forces. The success or failure of AFLC in maintaining an in-house cadre of essential logistics personnel may well determine the success or failure of the USAF in prosecuting its wartime mission.

References

1. AFLC/CV Letter, "Revised OMB Circular A-76," 22 June 1979.
2. AFR 26-1, *Manpower Policies and Procedures*. HQ USAF, Washington, DC.
3. AF/MPM Letter, "Future of A-76 Contracting," 7 June 1982.
4. DODD 4100.15, *Commercial and Industrial-Type Activities*. ASD (MRA&L), Washington, DC: 4 February 1980.
5. DODD 4151.1, *Use of Contractor and DOD Resources for Maintenance of Materiel*. ADS (MRA&L), Washington, DC: 15 July 1982.
6. DODI 4100.33, *Operation of Commercial and Industrial-Type Activities*. ADS (MRA&L), Washington, DC: 25 February 1980.
7. OMB Circular No. A-76, *Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government*. Office of Management and Budget, Washington, DC: 29 March 1979, and Revised Transmittal Memorandum No. 6: 26 January 1982.
8. Public Law 93-365, "Laws of 93rd Congress - 2nd Session," Title V, Section 502, 5 August 1974, 88 Statute, page 404.
9. Public Law 96-342, "Laws of 96th Congress - 2nd Session," Title V, Section 502, 8 September 1980, 94 Statute, page 1086.
10. Public Law 97-252, "Department of Defense Authorization Act, 1983," 8 September 1982:
    a. Title III, Section 305, S2248-7, "Limitation on Studies of Contracting Out of Certain Commercial and Industrial Type Functions."
    b. Title XI, Section 1112, S2248-30, "Modification of Reports on Conversion of Commercial and Industrial Type Functions to Contractor Performance."
11. United States Code, Title 10, "Armed Forces." Congress, by Act, 10 August 1956, Chapter 1041, Section 1, 70 A Statute 1, revised, codified, and enacted into law Title 10 of U.S.C., entitled "Armed Forces."

Editor's Note: This article, although a year old and very close to being overtaken by events, describes crucial USAF concerns with "contracting out." Our reviewers urged publication, so we have done just that. Mr. Gracie is quick to admit that suggested changes to OMB Circular A-76 and other working proposals are extremely significant and relevant. (31 Aug 83)

*Some of these factors were originally proposed in AFLC/CV Letter, "Revised OMB Circular A-76," 22 Jun 79.

CAREER AND PERSONNEL INFORMATION

Civilian Career Management

Logistics Civilian Career Enhancement Program (LCCEP)

Are you an LCCEP Executive Cadre member or an applicant? When notified of your selection or nonselection for the Executive Cadre in past cycles, did you understand the process used to identify and induct new Cadre members? An explanation of Cycle IV, which is currently underway and scheduled to be completed this December, will help you better understand the annual Executive Cadre selection effort. While the process will not have been completed at the time this article is published, this description reflects all planned events as having been accomplished.

Although the number of Cadre applicants and the selection methodology have differed slightly for each cycle, certain important facts remain firm. Each cycle is a very precise and systematic process that evaluates approximately 8,000 qualified logisticians to select about 400 Executive Cadre members. The odds against making Cadre membership are about 20 to 1. To those who survive the process, and who are identified among the top 5% of Air Force logisticians each cycle, selection is a tribute to their past performance and management recognition of their future potential. To those who are still struggling to make the Cadre, each cycle represents a new opportunity.

The baseline for the Cycle IV Cadre Selection was established effective with the end-of-month May 1983 update of the Personnel Data System-Civilian (PDS-C). Program registrants who had applied for Cadre consideration during the April 1983 open season, as well as former applicants and Cycle I Cadre members, composed the file of record. Past Air Force experience and CPAS ratings were very important elements of data considered in the selection process.

The Cycle IV Cadre selection process consisted of three phases. Phase I was a mechanical review of all registrants, using an Air Force-wide promotion evaluation pattern (PEP), which screened for the basic eligibility required for further consideration for the Cadre. This produced a list of candidates by command/air logistics center (CMD/ALC) and by grade. Phase II was managerial evaluation and assessment of candidates at each CMD/ALC, using standardized criteria provided by the Office of Civilian Personnel Operations (OCPO). Phase III was referral of the highest ranking candidates for panel interviews. The number of candidates referred for interview from each CMD/ALC was based on a percentage of total Air Force applicants.

Approximately 1300 Cadre candidates were referred for interview. Interview panels were established and staffed with Cycles II and III Cadre members. OCPO provided guidance to all panels to ensure that interviews were uniformly conducted. Air Force panels interviewed GM-14s/15s; regional panels interviewed GS/GM-13s; and locally established CMD/ALC panels interviewed GS-11s/12s.

Based on responses to the questions asked by the interview panels, a numeric score was assigned to each interviewee. This score, within the applicable grade level held by candidates on 31 May 1983, became the final criterion for Cadre selection. At Air Force level, all candidates at the same grade level were aligned from the highest interview score to the lowest. Final selection and identification of new Cycle IV Executive Cadre members was accomplished by simply taking the highest ranked candidate at a certain grade level and counting down the final ranking until the approved Cadre induction figure for that grade was reached. The final step was notifying the new Cadre members of their selection.

The foregoing explanation of the Cadre selection process outlines the systematic approach that leads to Executive Cadre identification. Your past or future selection is indeed a tribute to your past performance and recognition of your future potential in contributing to the Air Force mission.

Military Career Management

What is PALACE LOG?

Every logistics officer and high level manager of Air Force logistics resources should be familiar with the term PALACE LOG. Briefly, PALACE is a code word applied to officer career management teams at the Air Force Manpower and Personnel Center (AFMPC) for selected career specialties. Under the PALACE team concept, selected officers represent their respective career specialties in the personnel business. The Logistics Career Management Section (PALACE LOG) encompasses the officer management teams for the Logistics Plans and Programs, Maintenance/Munitions, Contracting and Manufacturing, Supply, and Transportation fields.

PALACE LOG was established in the summer of 1971 to satisfy several functional objectives. The primary objective was to centrally manage all logistics officers to optimize distribution, placement, and use of the limited resource of experienced talent. Another equally important objective was to develop the logistics generalists and specialists who would plan and manage the complex logistics systems of the future. And, finally, there was a need to centrally manage promising future logistics leaders and to provide career patterns which would fully develop their potential.

The Air Staff (DCS/LE) transferred manpower spaces to the AFMPC, and career logistics officers were assigned to assume these tasks. PALACE LOG teams are directly involved in a multitude of actions representing all interests of functional managers and logistics officers in the personnel field.

The teams try to integrate Air Force requirements with individual desires by assigning the *right* man to the *right* job at the *right* time. Career and resource managers operating as a resource management team work closely with functional and personnel managers at all levels of command to ensure that Air Force requirements and desires of logistics officers are considered in every assignment. Under this central system, PALACE LOG teams ensure that all 10,000 logistics officers will be assigned to the most challenging CONUS or overseas requirement that they are qualified to fill, rather than be "wholesale" allocated to a major command--as was done in the past.

The tools are available at AFMPC to effectively match the man with the job. The teams are required to know what the jobs are worldwide and the qualifications needed to fill those jobs. Command and special category (SPECAT) requirements are received 8 to 12 months before an officer is needed, and job descriptions are reviewed to identify the specific experience required. Using these requirements as a starting point, the teams then review their resource to identify candidates for the position. Each officer's record is extensively reviewed and his eligibility for assignment is verified in relation to others in that grade and specialty. Also, career management options are evaluated (education, training, professional military education, levels and types of assignments needed for career enhancement) and individual career objectives (AF Form 90) are considered. In addition, the proposed match is coordinated with MAJCOM personnel and functional staffs before the end assignment is entered into the automated personnel data system (APDS).

Although the majority of PALACE LOG efforts are devoted to job matching, the teams actually do much more. For example, they participate in personnel policy matters impacting on logistics officers; advise functional managers of resource trends (promotions, losses, education quotas, problems); participate in the review of candidates for AFIT and Education-With-Industry programs; participate in AFIT course reviews and advise on Air Force educational needs; approve all intracommand assignments; schedule en route training; evaluate and approve cross-training and career-broadening assignments; and perform a variety of other personalized services to assist and benefit logistics officers and managers.

PALACE LOG teams are dedicated to represent functional managers and individuals within their resources. Every effort is made to present PALACE LOG briefings at command conferences and personally discuss career planning opportunities with as many people as possible. Also, the teams brief their functional managers at the Air Staff at least once a year so they can assess the PALACE LOG team efforts and recommend improvements.

The APDS gives the teams automatic data processing and up-to-date information. The system is designed to integrate ADP technological advances into a total personnel management system. At fixed dates up to 18 months into the future, it allows PALACE LOG teams to rapidly review all job openings in conjunction with the forecasted availability of qualified logistics officers. It also furnishes automatic notices that provide the individual with advanced notification on decisions which affect him. Teams have immediate access to personnel information within the resource for both assignment and career management actions. APDS makes historical, current, and predictive information readily accessible to management needs. There are some problems associated with any data system, but APDS provides PALACE LOG teams with the capability to do even more for logistics officers and their chains of command.

Remember, PALACE LOG officers now working at AFMPC are part of the resource they manage and are striving to make every beneficial improvement they can during their tour in the personnel business. They stand ready to assist in any way they can to give logistics managers the best personnel support possible.

Item of Interest

Small (Micro) Computer Standard Set

By the end of August, the Air Force Computer Acquisition Center (AFCAC) is expected to announce the award of a requirements type contract for a standard small (micro) computer system. This contract is the culmination of efforts by the Air Force Small Computer Office Automation Service Organization (AFSCOASO), the Air Force Data Systems Design Center (AFDSDC), the AFCAC, the Air Force Logistics Management Center (AFLMC), and the HQ USAF Logistics staff to establish a standard for small (micro) computers that will meet approximately 80% of the needs of the Air Force's general purpose users.

Contract specifications were written so the user can tailor components of the standard system to fit specific needs through the selection of compatible peripheral devices, main memory expansion, communications, utility software, and support options. Not all systems purchased on this contract will be identical. The system will be individually configured for stand-alone, single-user applications and software compatibility which will permit effective integration into other DOD programs (e.g., LIMSS, DDN). The minimum system requirements include a processor capable of running object code software written for the CP/M 2.2 or later (8-bit) operating system, 64 K bytes of main memory, communications ports, 5¼" floppy disk drives, a keyboard/video display unit, a BASIC Interpreter, and Diagnostic Software. Mandatory expansion capabilities include a processor able to execute the 8086/8088 or 68000 microprocessor instruction set, 256 K bytes of RAM (Random Access Memory), IBM compatible 8" floppy disk drive, 5 M bytes of hard disk storage (Winchester) with back-up capability, dot matrix and letter quality printers, modems, and 4-pen graphic plotter. Additional software requirements include BASIC, COBOL, FORTRAN, and PASCAL compilers, Word Processing Software, Data Base Management System, Spreadsheet Program, and graphics software.

Once the contract is awarded, it may be modified to include additional components necessary to expand/upgrade the system. The contract is written for maximum flexibility by letting the user specify which components are needed for the individual system. Standardized components for general purpose users will be compatible with each other and many of the standard Air Force systems.

The need for so versatile a system, as well as concerns voiced at the AFLMC-hosted 1982 CROSS TALK Conference, led to the USAF logistics policy for the use and development of small (micro) computers. The success of the policy requires the interface of five offices: the Air Staff logistics focal point (HQ USAF/LEXY), the MAJCOM logistics focal points for small (micro) computers, the AFLMC, the AFDSDC/LG, and the AFSCOASO (AFDSDC/DMT).

The relationship between these five players is the key to gaining the maximum value for small (micro) computer applications. The Air Staff logistics focal point will provide overall guidance concerning the functional utilization of small (micro) computers. Each MAJCOM can direct its attention toward command priorities. The AFLMC will serve as a clearing house/repository to keep commands informed of ongoing and completed logistics initiatives. The AFDSDC/LG will manage AF standard logistics systems. The AFSCOASO will explore and advise on AF-wide applications of small (micro) computers.

Questions on the small (micro) computer standards can be directed to Major Pete Donohue, AFSCOASO (AFDSDC/DMT), Gunter AFS AL 36114, AV 446-3282. Those concerning the development of logistics policy should be directed to Capt Tom James, AFLMC/LGY, Gunter AFS AL 36114, AV 446-4524.

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On Base-Level Stocking Decisions for Low Demand Items

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Introduction

The Air Force has a sizeable logistics structure to support its many squadrons of aircraft. Two key objectives of this support are (1) to have spare parts and supplies where and when they are needed, and (2) to minimize the required cost. However, there is a tradeoff between these two objectives. It would be too expensive to stock all parts at every base. On the other hand, if parts were only stocked at central depots—a relatively low-cost strategy—most aircraft would not be operational because they would be awaiting parts to be shipped from the central depot to the bases. Obviously, the best strategy is somewhere between these extremes.

The problem is extensive for three reasons:

(1) Military aircraft are so complex that failures occur quite often. Typical flight durations are from two to ten hours, and there are often one or more failures per flight. This however results in surprisingly few mission aborts due to the considerable redundancy built into most aircraft. On landing the failed items must then be repaired or at least replaced prior to the next flight. These actions usually require one or more spare parts to be available at the base or to be shipped from a central depot.

(2) Aircraft are composed of many different equipment items and parts. The typical aircraft has about 2,000 work unit coded repairable items (those that can be either replaced or repaired directly at the aircraft location). Also, there are many additional parts used in base repair shops.

(3) Aircraft parts are very expensive. Most unit prices range from \$100 to \$50,000. Item replacement becomes a strong "cost driven" consideration.

How does the Air Force meet this significant logistics problem? At present, "fast-moving" items are stocked at both base and depot levels, while most "slow-moving" items are stocked only at the depot. Under this policy, an item is stocked at base level if there has been either one demand for the item in the last 180 days or two demands during the last year. Otherwise, the item is not stocked at the base. (An exception occurs when special negotiated levels are established, but this is relatively rare.)

How effective is the current policy? To answer this question, Captain David Dawson recently analyzed aircraft downtime data from the aircraft mission capability (MICAP) requisition status reporting system (D165B).[1] He found that a significant percentage of reported aircraft downtime was due to items not being stocked at the base. Captain Dawson's analysis, as well as our own, is based upon NORS (not operationally ready—supply) data because this information was readily available. The Air Force has since changed its system for aircraft status reporting. NORS is almost the same as NMCS (not mission capable—supply), the acronym being used in the current system.

Table 1 shows the results of Captain Dawson's analysis. About 34% of B-52 supply downtime is for items that are not stocked at base level. Similarly, over half of the KC-135 supply downtime hours are associated with the slow-moving items. For A-7D, FB-111A, and F-111 aircraft, about 33% of supply downtime hours are associated with these items.

Captain Dawson's analysis indicates **that non-stockage at the base level is a significant contributor to aircraft supply downtime.** The critical question is whether or not it is economically desirable to reduce this downtime by stocking such low demand items at the base. Specifically, is the value of potential increases in aircraft availability sufficient to justify additional base-level inventories?

Aircraft Type	Percent Downtime
B-52	33.9
KC-135	57.2
A-7D	34.7
FB-111A	33.8
F-111	34.7

Table 1: Percent of Supply Downtime Due to Not Stocking Items at Base

Algorithm Development

We will now discuss the mathematical details of a model to evaluate the potential cost-effectiveness of stocking low demand items at base level and will describe the use of this model to locate specific Air Force items with high benefit/cost ratios. Surprisingly, the special case considered here eventually leads to very simple benefit/cost formulas, even though we begin with the very complex mathematical expressions required to predict aircraft availability. Those readers not interested in mathematical details should proceed to the "Results" section.

The LMI Availability Model

We used the Logistics Management Institute's (LMI) availability model as a starting point for our analysis. This model was developed by LMI as a means of relating the expected number of operational aircraft to alternate Air Force stocking policies. Proofs and other mathematical details for this model are presented in Appendix 3 of the LMI report on TASK 72-3, "Measurements of Military Essentiality," dated August 1972.[2]

The LMI availability model may be stated as follows:

N = quantity of aircraft in the system

j = index of a particular component, or item, of the aircraft, $j = 1,2,\ldots,K$, where K is the total number of items

c_j = unit cost of component j

QPA_j = quantity of component j on one aircraft

s_j = quantity of spares for component j stocked at a particular location

$BO_j(s_j)$ = expected quantity of back orders on component j when the stock level for this component is s_j.

In this model, it is assumed that demands obey a stationary Poisson process, that repair and resupply times are independent random variables, and that an (s − 1, s) inventory policy is used. Expected back orders at a random point in time are given by

$$BO_j(s_j) = \Sigma_{x = s_j + 1} (x - s_j)\, p(x|\mu_j) \quad s_j = 0, 1, 2, \ldots$$

where $p(x|\mu_j)$ denotes the probability that there are x assets in the repair/resupply pipeline and μ_j denotes the expected number of assets of item j in repair or resupply. In the special case in which $s_j = 0$, $BO_j(s_j) = \mu_j$. That is, if there are no spares, the expected number of back orders equals the expected number of assets in the repair/resupply pipeline.

Now let q_j denote the probability that a randomly selected aircraft at a randomly determined point in time does not have any components of type j missing. Mathematically,

$$q_j = \left(1 - \frac{BO_j(s_j)}{N \cdot QPA_j}\right)^{QPA_j}$$

This expression results from the following arguments: If all N aircraft are to be operational, the total number of units of component j needed is $N \cdot QPA_j$. Remember that $BO_j(s_j)$ denotes the expected number of "holes" in aircraft due to back orders of component j when s_j is the base stock level. Hence, $BO_j(s_j)/(N \cdot QPA_j)$ is the probability that a particular "hole" for item j is empty due to a back order on that item. Hence, one minus this value is the probability that a given unit of component j is *not* causing the aircraft to be inoperable. Finally, since each aircraft contains QPA_j, units of component j, we must raise the probability that each component j unit is operational to the QPA_j power to determine the probability that *all* QPA_j units are operational simultaneously. This gives us the above expression for q_j.

Once the component availabilities q_j are known, we may determine Q, the probability that a randomly selected aircraft is operational. This is given by

$$Q = \prod_{j=1}^{K} q_j$$

That is, the probability that a randomly selected aircraft is operational equals the probability that none of its components is in a back-order status. Finally, the expected number of operational aircraft in a fleet of N aircraft is $Q \cdot N$. Hence, the expected number of operational aircraft, ENOA, is given by

$$ENOA = \left(\prod_{j=1}^{K} q_j\right) \cdot N$$

Without loss of generality, we may assume that each item j is numbered in order of increasing demand rates. Hence, ENOA may be written as

$$ENOA = \left(\prod_{j=1}^{J} q_j\right)\left(\prod_{j=J+1}^{K} q_j\right) \cdot N$$

where J denotes the number of items with very low demand rates (items with demand rates less than one demand in 180 days, or .0056 demands/day). This expression may be further simplified to $ENOA = Q^L \cdot Q^H \cdot N$, where Q^L and Q^H denote the first and second product terms, respectively, on the right-hand side of the above expression. The term Q^L denotes the probability that a low demand item is *not* causing a "hole" in a randomly selected aircraft, while Q^H similarly denotes the probability that a high demand rate item is *not* causing an aircraft to be inoperable.

If no back orders ever occurred for low demand items, the expected number of operational aircraft would be $N_o = Q^H \cdot N$. Hence, Q^L measures the impact upon aircraft availability after supply problems for high demand rate items have been accounted for. Combining the above relations, we obtain

$$(1) \qquad ENOA = N_o \cdot Q^L = N_o \cdot \prod_{j=1}^{J} \left(1 - \frac{BO(s_j)}{N \cdot QPA_j}\right)^{QPA_j}$$

In the following analysis, we will restrict our attention to stocking policies for the low demand rate items represented in the product term on the right-hand side of (1). Since each of these items has a very low demand rate, (1) may be greatly simplified. First, observe that (1) may be written in expanded form using the binomial expansion as:

$$(2)\ ENOA = N_o \cdot \prod_{j=1}^{J} \left[1 - \frac{BO_j(s_j)}{N} + \frac{QPA_j(QPA_j - 1)}{1 \cdot 2}\left(\frac{BO_j(s_j)}{N \cdot QPA_j}\right)^2 - \ldots\right]$$

For low demand items, $BO_j(s_j)$ will be very small, even when $s_j = 0$. Hence, in this case, all terms involving quadratic or higher powers of $BO_j(s_j)$ will be negligible. Thus, a good estimate for ENOA is given by

$$(3) \qquad ENOA = N_o \cdot \prod_{j=1}^{J} \left[1 - \frac{BO_j(s_j)}{N}\right]$$

Now observe that if we expand (3), we obtain

$$(4)\ \ ENOA = N_o \cdot \left[1 - \frac{\Sigma_j BO_j(s_j)}{N} + \Sigma_{ij} \frac{BO_i(s_i) BO_j(s_j)}{N^2} - \ldots\right]$$

Again, if $BO_j(s_j)$ is small for all s_j, the third and higher order terms inside the brackets of (4) will be negligible. Hence, if we restrict our attention to low demand items, a good estimate of the expected number of operational aircraft is

$$(5) \qquad ENOA = N_o \cdot \left[1 - \Sigma_j \frac{BO_j(s_j)}{N}\right]$$

which may be written as

$$(6) \qquad ENOA = Q^H \cdot \left[N - \Sigma_j BO_j(s_j)\right]$$

From (6), the expected number of operational aircraft equals Q^H times the number of assigned aircraft, N, less the expected number of aircraft that is inoperable due to lack of serviceable spares for each low demand item j.

The Decision To Stock One Unit

Suppose that item j is not currently stocked at a given base. In this case, $s_j = 0$. Hence, from (6), the expected number of operational aircraft at this base is reduced by $BO_j(0)$ due to back orders on item j. But, from Sherbrooke (1966)[3]

(7) $$BO_j(0) = \lambda_j T_j$$

where

λ_j = demand rate for item j
T_j = average repair/resupply time for item j

Note that $\lambda_j T_j$ is simply the expected number of assets in the repair/resupply pipeline. If item j is a repairable item, it is generally assumed that

$$T_j = r_j A_j + (1 - r_j)\left[O_j + \delta(s_o) \cdot D_j\right]$$

where

r_j = fraction of failures repaired at base level
A_j = base repair cycle time
O_j = depot-to-base order and ship time
D_j = average time required to ship an unserviceable item to the depot and to return the item to a serviceable condition
$\delta(s_o)$ = average amount of time a requisition for depot stock spends waiting for a serviceable asset when the depot stock level is s_o. The $\delta(s_o)$ is expressed as a fraction of D_j.

On the other hand, if item j is an equipment or consumable item, the average repair/resupply time is generally difficult to compute analytically. However, there are several important special cases. First, many equipment items may be repaired at base level. If so, the previous equation for T_j for repairable items may be used. Second, if there is no base repair, but sufficient depot stocks of item j are held so that a random demand on the depot will almost certainly be filled off-the-shelf, the T_j simply equals the average depot-to-base order and ship time O_j. At the other extreme, if item j is not stocked at the depot and lateral resupply is not possible, then $T_j = O_j + D_j$, the sum of the times required to order the replacement item from the depot and the time required for the depot itself to order and receive the replacement unit from its supplier. Finally, another important case occurs when worldwide demand is sufficiently low that an $(s - 1, s)$ inventory policy is appropriate at the depot level. In this case, the average base resupply time, T_j, may be estimated from

$$T_j = O_j + \delta(s_o) D_j$$

where O_j = depot-to-base order and ship time and D_j denotes the time required for the depot to order and receive a replacement unit, and $\delta(s_o)$ is the average depot delay fraction.

In our study, time constraints forced us to restrict our attention to low demand repairable items. However, we believe that large numbers of equipment and consumable items may be adequately modeled using one of the above estimates and the procedures to be discussed.

Let us assume that we have appropriate estimates of λ_j and T_j for all items j under consideration. We now wish to determine the impact of increasing the stock level of item j by one unit.

In general, if the stock level for item j is increased by one unit (to $s_j + 1$), the increase in expected operational aircraft is, from (6),

(8) $$\Delta ENOA_j = Q^H \cdot \left[BO(s_j) - BO(s_j + 1)\right]$$

By definition of BO (s_j), it is easy to show that

(9) $$BO_j(s_j + 1) = \left[BO_j(s_j) - \left(1 - F_j(s_j)\right)\right]$$

where

(10) $$F_j(s_j) = \sum_{n=0}^{s_j} p_j(n)$$

and $p_j(n)$ denotes the probability of n assets of item j in the repair/resupply pipeline. The increase in expected operational aircraft due to a unit increase in s_j is then

(11) $$\Delta ENOA_j = Q^H \cdot \left[1 - F_j(s_j)\right]$$

Equations (7) - (11) hold for all possible values of s. In the special case in which $s_j = 0$, equation (11) simplifies to

(12) $$\Delta ENOA_j = Q^H \cdot \left[1 - F_j(o)\right]$$

(13) $$= Q^H \cdot \left[1 - p_j(o)\right]$$

For very low demand rates, the expected number of assets μ_j in the repair/resupply systems for a specific item j is often approximately Poisson distributed. Hence,

(14) $$p_j(n) = \frac{e^{-\mu_j} \mu_j^n}{n!}, \quad n = 0,1,2,\ldots$$

which implies

(15) $$p_j(o) = e^{-\mu_j}$$

Using this result in (13), we obtain

(16) $$\Delta ENOA_j = Q^H \cdot \left[1 - e^{-\mu_j}\right]$$

It is well known that

(17) $$e^{-u} = \sum_{n=0}^{\infty} \frac{(-\mu)^n}{n!}$$

Hence, (16) may be written as

(18) $$\Delta ENOA_j = Q^H \cdot \left[\mu_j - \frac{\mu_j^2}{2!} + \frac{\mu_j^3}{3!} - \frac{\mu_j^4}{4!} + \ldots\right]$$

Again, recall that we are restricting our attention to items with very low demand rates. For example, for items with no more than two demands per year, $\lambda < 2/365$, or .0055. If the base repair cycle time T is 10 days, then $\mu = \lambda T < .055$. Hence, if λ is small, the quadratic and higher terms of (18) are negligible. In this case, (18) is approximately

(19) $$\Delta ENOA_j = Q^H \cdot \mu_j = Q^H \cdot \lambda_j T_j$$

This is a remarkably simple result. It states that the improvement in the expected number of operational aircraft at a given base due to stocking one spare (rather than none) of a low demand item at that base approximately equals the product of Q^H, the probability that no high activity item is causing an aircraft to be unavailable, and of μ_j, the expected number of back orders associated with a zero spares policy.

Equation (19) may also be derived using the following intuitive argument: Remember, we are assuming that the demand rate for item j is very small (less than two demands per year). Thus, even with zero spares, the expected number of back orders at a random point in time will be very small. Unfortunately, if there are no spares (and cannibalization is not permitted), when a back order finally does occur, it will cause a "hole" in an aircraft. However, with a demand rate this low, carrying a single spare of item j will effectively eliminate all probability of a back order for item j. Thus, the reduction in the expected number of aircraft with "holes" due to item j is approximately equal to μ_j, the expected number of back orders for item j when no spares are carried. Finally, the Q^H term in equation (19) accounts for the fact that adding a spare of item j will not cause an aircraft to become operational if one or more other mission-essential items are missing from the aircraft.

A Benefit-to-Cost Ratio

Let us summarize our analysis so far. First, we are restricting our attention to repairable items with very low demand rates (demand rates of less than two units per year). We wish to compute the improvement $\Delta ENOA_j$ in the expected number of operational aircraft if one spare asset of some item j is stocked at base level (rather than none). Beginning with the LMI availability model, we have shown that the expected improvement is simply $Q^H \cdot \mu_j$, the product of the probability Q^H that a high demand item is not causing an aircraft to be unavailable, times the average number of assets μ_j in the repair/resupply process for the specific low demand item j. In turn, μ_j equals the product of the demand rate, λ_j, for item j and the average repair/resupply time, T_j.

Let us now develop a benefit-to-cost ratio that may be used to identify specific low demand items that are particularly attractive candidates for stocking at base level.

Using parameters from the LIST (logistics investment screening technique) data base (4),

(20) $$\lambda_j = \frac{\text{annual demands}}{\text{year}}$$

(21) $$T_j = \frac{\text{downtime hours due to supply}}{\text{annual demands}}$$

Hence,

(22) $$\Delta ENOA_j = \lambda_j T_j \cdot Q^H = \frac{\text{annual demands}}{\text{year}} \cdot \frac{\text{downtime hours due to supply}}{\text{annual demands}} \cdot Q^H$$

$$= \frac{\text{downtime hours due to supply}}{\text{year}} \cdot Q^H$$

Also, since total base NORS rates are typically 5% or less, Q^H should be greater than .95. And, since there are 8760 hours per year,

(23) $$\Delta ENOA_j = \frac{\text{annual downtime hours due to supply/year}}{\text{8760 hours/year}} \cdot (.95)$$

If it is assumed that the value to the Air Force of making one more aircraft available is the purchase cost (unit price) of that aircraft, then the benefit is

(24) $$BENF_j = \Delta ENOA_j \cdot UP_a$$

where

$BENF_j$ = benefit for stocking item j
UP_a = unit price of aircraft type "a"

The investment required to stock one item at each base is simply

(25) $$INVST_j = UP_j \cdot NBASES_a$$

where

$INVST_j$ = investment
UP_j = unit price of equipment item j
$NBASES_a$ = number of bases at which a type "a" aircraft is stationed

The gross benefit-to-investment ratio is then

(26) $$BTIR_j = \frac{BENF_j}{INVST_j}$$

Items with high benefit-to-investment ratios represent good candidates for stockage at base level. To identify those items with the greatest potential benefit, we calculated this ratio for all items in the LIST data bank.

Results

In the two previous sections, we developed a benefit-to-cost ratio to evaluate the cost-effectiveness of stocking a low demand but potentially NORS causing item at base level. In this section, we describe the application of this ratio to identify particularly promising stocking alternatives.

The algorithms previously described were programmed on a CYBER 6600 computer and used to screen through the over 22,000 items in the LIST data base. This data base was developed by personnel of the PRAM Program Office, Wright-Patterson AFB, and is described in detail.[4]

The data base contains over 50 key logistics parameters extracted from six different Air Force data systems. The data base encompasses 31 inventory aircraft and over 120,000 work unit coded items.

While data for support cost, manpower, etc., which is work unit coded, is available on all 120,000 plus equipment items, data on demand rates and unit prices is available only on those items with a cross reference between work unit code and master stock number. At present, only 22,000 of these items are cross-referenced. Although the percentage of cross-referenced items is small, they account for over half of the equipment failures.

Of the 22,000 items cross-referenced in the data base, our analysis indicated that 159 items had a potential benefit-to-investment ratio greater than 24:1 and had a much larger number of items occur at lower ratios. Also, a more complete cross reference would increase the number of items which exceed this threshold. The 24:1 ratio was selected arbitrarily to identify a relatively small number of high potential items for more detailed analysis.

Figure 1 shows a portion of the results for items with an estimated return on investment ratio greater than 24:1. (NOTE: In these runs, Q^H was set to 1.0.) Each equipment item is

Aircraft	Work Unit Code	Master Stock Noun	Demand Rate	Annual Demand Per Base	NORSG Hours	Unit Price Equipment	Benefit Dollars	Investment Dollars	Benefit Investment Ratio	Item Manager ALC CODE
A007D	13AAB	Door	.0026	.715	835.	1324.	285959.	10592.	27.00	OC BHX
KC135A	14AE0	Panel Ay	.0046	.300	1200.	707.	684932.	22624.	30.27	OC CTT
F111A	45AAJ	Pump Hand	.0229	1.947	111.	333.	139384.	667.	209.10	OC NED
C130A	47211	Regulator	.0118	.797	174.	197.	93356.	3154.	29.60	OC NTD
B052D	41ACL	Valve	.0157	1.005	200.	741.	253425.	3705.	68.40	OC NTG
KC135A	41352	Amplifier	.0272	1.777	365.	204.	208333.	6512.	31.99	OC NTR
B052D	41GAE	Control	.0100	1.280	179.	373.	226815.	1865.	121.62	OC NTU
A007D	14GEC	Cylinder	.0012	.660	687.	920.	235274.	7357.	31.98	OC NVG
A037	13135	Cylinder	.0179	1.637	403.	144.	27603.	1009.	27.35	OC NVI
A007D	13BAA	Valve	.0041	.564	167.	201.	57192.	1610.	35.53	OC NVO
A037	51222	Transmitter	.0327	1.495	1539.	541.	105411.	3786.	27.85	OC RNA

Figure 1: Added Spares Stocking Policy Results.

identified by the aircraft type (MDS), equipment work unit code, and the master stock noun.

The demand rate per 100 equipment flying hours is shown next. Knowing the quantity per application (QPA), annual fleet flying hours, and the number of bases, the average annual demands per base are calculated and displayed. Note that this is always less than 2.00. If the demand per base was 2.00 or greater, we assumed the item is stocked at the base and excluded it from further analysis. The NORSG hours (annual fleet grounding hours due to supply) is then shown, followed by the unit cost for each item. Finally, the benefit, investment, and benefit-to-investment ratio for each item are displayed. These were calculated using the algorithms presented previously.

To illustrate our results, consider the third item in Figure 1. This line indicates that a hand pump used on the F-111A accounted for 111 NORSG hours during the one-year period covered by our data base. This item has a demand rate of .0229 units per hundred flying hours and has an average base demand rate of 1.947 units per year. This item costs $333 per unit, and an investment of $667 would be required to stock one unit of this pump at the two user bases. As shown in the figure, if each NORSG hour is priced out at the equivalent cost per hour of a new aircraft, a benefit-to-investment ratio of 209 is implied.

Since erroneous data can creep into the best of data systems, our initial listing only shows potential candidates for additional investigation. It is then necessary to confirm with the item manager that an item is actually a good candidate. To speed this process, the item manager is identified by air logistics center (ALC) and item manager code. With the ALC and code, a phone number and name can be easily located on frequently updated item manager assignment lists.

We called the item managers on over a dozen items. In many cases, we found that, at any point in time, only a few of the bases were actually stocking the item, while most of the bases were not. This would be expected for items with an average demand per base near 2.0. The supply downtimes (NORS hours) were, of course, coming from bases not stocking the item. This indicates that our estimate for the cost of stocking items at the base level is somewhat conservative, since in actual practice, some of the bases already stock the item.

In some instances, we found that the stocks on hand at the depot were sufficient to allow stocking an item at each base without any new procurement—the cost would merely be that of redistribution. There was even an example where the depot stock was in excess and had been destroyed.

We also found a case of improper identification and one discontinued item. While the initial sample check over the telephone increased our confidence in the analytic results, further validation will be required before full confidence can be placed in the results.

Another potential problem is that the cost-benefit ratios are biased, in that only items with reported NORSG hours were included in the calculations. Hence, our estimates of NORS-related demand rates are biased upwards. This bias is smallest for items that have a large number of demands across all bases (ten or more), but still less than two demands per base, and is largest for the very low usage items. Fortunately, it appears that most of the attractive investment opportunities fall in the higher demand rate categories. Nevertheless, despite the potential bias, our results indicate that the formulas described earlier are useful in identifying good candidates for alternate stocking strategies.

Conclusions and Recommendations

Our results indicate that the present Air Force policy as to whether an item should be stocked at the base level may not be optimal in some cases. This is not, of course, very surprising, as the present policy is based primarily on demand rates and does not usually consider whether or not an item causes aircraft downtime due to supply, the amount of downtime, or the cost to stock the item at the base level.

Sometimes, it appears that for a relatively small investment, the more glaring discrepancies created by the present policy might be plugged. What is required next is to take specific cases uncovered by our analysis and examine them in detail to determine if the benefits indicated in our analysis are achievable in the real world. We recommend such an evaluation.

Finally, it appears that in the long term, it might be beneficial for the Air Force to revise its policy for determining whether an item should be stocked at the base. In addition to item demand rates, a revised policy should also consider the potential impacts on aircraft availability and the economics involved in stocking the item. The LMI availability model provides a mathematical framework from which such a revised policy might be developed.

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Microcomputers In ATC Wing-Level Maintenance Analysis

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Introduction

Implementation of a microcomputer system at each ATC flying training wing maintenance analysis activity during the period May 1982 through November 1982 has sharply reduced the manual workload, significantly enhanced analysis capabilities, and greatly improved the timeliness and accuracy of daily aircraft status reporting.

Background

Prior to late 1982, aircraft maintenance analysis within ATC consisted almost totally of manual processes. Although most of the raw data was drawn from the maintenance management information and control system (MMICS) and the maintenance data collection (MDC) system, the analysis was entirely manual because these systems do not provide graphics, plotting, statistical, and "what if" capabilities. In addition, any higher headquarters maintenance reporting requirements that were not satisfied by USAF and command unique systems on the B-3500 computer had to be accomplished manually. Foremost among these reporting requirements was a daily aircraft status call-in report that required considerable manual effort in the early morning hours for transmission from the bases, and later transcription and data entry at HQ ATC.

The proposed automation of ATC wing-level maintenance analysis and reporting functions had been discussed since the early 1970s, but had not been accomplished for several reasons. First, the cost of hardware was too high and had not decreased to the point that a cost/benefit analysis would support a data automation requirement (DAR) for such a system until now. In addition, commercial software technology had not progressed to the point where off-the-shelf software could enable a small computer system to be easily used by personnel not having computer programming knowledge and skills. Finally, with the approval process so cumbersome and lengthy; the hardware, software, and telecommunications requirements so costly and complicated; and a general lack of agreement as to what was really needed, the idea had never proceeded beyond the talking stage.

During this period, however, HQ ATC logistics analysis activities had acquired a minicomputer system and had developed more than 300 programs to analyze data from ATC bases and to provide the LG staff with management reports and graphs. Beginning in June 1981, HQ ATC/LG began to expand the system by doubling on-line storage capacity, increasing the number of terminals from one to five, quadrupling memory size, and obtaining telecommunications capabilities. This caused renewed interest in providing ATC maintenance analysis activities with a small computer that could communicate with the HQ ATC minicomputer.

The Idea Germinates

In September 1981, when some fallout money became available, ATC/LGXA purchased an Apple II microcomputer system with a printer, two disk drives, telecommunications capabilities, and software to support spreadsheet, plotting, graphics, trend analysis, and word processing. Two NCOs—a maintenance analyst and a programmer—were given the task of developing programs that would accomplish the daily aircraft status report and transmit it directly from the microcomputer to the HQ ATC minicomputer over AUTOVON lines. During their analysis of the problem, they discovered that a command unique maintenance deviation reporting system on the B-3500 computer could be incorporated within the programs being developed for the microcomputer. The command unique system on the B-3500 was a significant user of manpower since it required manual preparation of keypunch creation sheets, keypunch, and at least one manual error correction cycle before the report was ready to transmit. Normally, the data reached HQ ATC from one to three weeks after the reporting date and often required considerable editing or follow-up with bases to obtain mission records or reports. Still, the system did not provide the base with an automated historical file for use in maintenance analysis.

The new system, base-level information maintenance program (BLIMP), was completed in April 1982 and consisted of 15 programs for the Apple II and one for the HQ ATC minicomputer. The Apple II programs are menu-driven and lead the user through the file building and reporting process by offering choices and prompts. In addition, the programs provide edits that were not previously available. The program for the HQ ATC minicomputer handles telecommunications log-on and log-off, editing of incoming data, notifying the sender of errors in data as it is received, file handling, and keeping track of which bases have completed their transmission and when.

Test of the System

The microcomputer system was taken to Laughlin AFB for a test beginning 1 May 1982. There was some apprehension that the frequently poor quality of AUTOVON lines might cause errors in the transmitted data. Although a few errors occurred early in the test, the problem was largely eliminated by switching on phase and amplitude equalizer circuits in the modem at HQ ATC. As the test progressed, Laughlin AFB maintenance personnel found more and more applications for the microcomputer until the original application, BLIMP, was relegated to a minor role. An NCO in Quality Control wrote a BASIC program to perform the weight and balance computations for T37 and T38 aircraft and produce a listing in the same format as the DD Form 365F. Manual computations took an average of an hour per aircraft; the program produced the same result in seconds. The plotting/trending software was almost continuously used in producing high-quality graphs and slides that formerly took hours of manual plotting and drawing. The word processing software was also used a great deal in preparing rosters and reports. By August 1982 the microcomputer was in use throughout the day from 0600 to 1700, with personnel waiting in a queue. A number of individuals who wanted to write programs for an application often worked after duty hours to complete and test them.

The test was judged a success by the end of August 1982, and a DAR was completed and approved in early September 1982 to authorize implementation at all other flying training bases. Bases acquired their own hardware and commercial software using end-of-year operation and maintenance (O&M) fallout money whenever possible. HQ ATC/LGXA sent two NCOs to the bases to help them hook up their hardware, implement the BLIMP system, and begin using the commercial software. Command-wide implementation was completed before the end of November 1982.

Results

The microcomputer system has been implemented command wide for more than six months. Errors in transmitted data are nonexistent for those elements that can be edited. Bases normally complete their daily transmission by 0700. This transmission includes the current status of their aircraft: assigned; possessed; not mission capable (NMC), partially mission capable (PMC), and full mission capable (FMC); a summary of the previous flying day's sorties; and detailed information regarding aircraft occurrences that caused deviations to the flying schedule. Transmission of these reports normally takes less than two minutes per base. HQ ATC/LGM has realized a significant savings in manpower for this reporting system since implementation. Before, two NCOs spent 60-90 minutes daily taking manual call-in reports and then keying the data into the minicomputer. Now, one NCO turns on the minicomputer and then goes about other work while the call-in reports are handled by the minicomputer. End-of-month processing of deviation data into the five-year history file used to take one NCO nearly a week to complete. Now it takes approximately 15 minutes and completely eliminates the use of punched cards.

Aside from the BLIMP system, the bases do not use their systems to the same degree. All of the bases are using graphics software for plotting and trend analysis. All are also using the word processing software, although some are using it for report writing, while others are using it for maintaining schedules and rosters. Some of the bases are using the spreadsheet software very extensively for analyzing data and for budgeting resources while others are not using it much. The amount of usage of each microcomputer seems to be directly related to the creativity and motivation of the NCOs and officers assigned to each maintenance organization.

Implementation of the microcomputer system has brought out hidden programmer talents in a number of NCOs and officers at the flying training wings, and a number of useful programs have resulted. The T37/T38 Weight and Balance Program developed by Laughlin AFB was distributed command wide. Subsequently, the discovery was made that the technical order covering the computations allowed bases considerable latitude in determining the value of certain constants, such as pilot weight, and not all of the bases were using the same values. The matter has been referred to SA-ALC for resolution. Although not all users have yet developed into programmers, they have been provided with a valuable tool to increase their understanding of computers and now may learn to use them to improve their productivity.

Future Plans and Lessons Learned

The microcomputer system selected has somewhat limited capabilities, although it was the best available at the time for the price. Many firms are developing and marketing circuit cards that will provide new capabilities for the microcomputer, and other firms are developing new software packages. Eventually cards that provide CP/M, expanded memory capacity, and multiprogramming and multiprocessing capabilities will be acquired. The microcomputers will be connected to the logistics information management support system (LIMSS) when it arrives.

Several important lessons resulted from the project. First, a system does not have to be expensive or complex to be effective. Each microcomputer system plus associated software for this project costs less than $5,000. All of the individuals involved in the project were assigned in logistics functional areas. With the exception of the DAR approval process, data automation was not involved in system development and implementation. However, the one individual with a computer programmer AFSC (51171A) did perform a major role in the project. Second, the user does not have to be a qualified programmer to be able to use a microcomputer if good commercial spreadsheet, graphics, data base manager, and/or word processing software is available. All that is really needed is the curiosity and willingness to read the software manuals and then to sit down and try to use the system. Time should be made available for prospective users to experiment with the system to find out how it works. Success in this endeavor will generate lots of enthusiastic users and new applications. Finally, the systems that have been implemented are generating manpower savings. An average of 50 man-hours per month, per base, is being realized with existing software and applications.

In summary, the computer revolution is continuing at a rapid pace and the microcomputer is a growing part of it. The Air Force should adopt management policies for microcomputers which recognize that they are different from large mainframe computers, and it should allow users to obtain microcomputers economically and promptly in order to take advantage of this technology.

"Wanting to plow new ground may be great, but one should also give some thought to new ways of plowing."

General James P. Mullins, USAF
Commander, AFLC

CURRENT RESEARCH

Air Force Logistics Management Center - FY83 Program

Periodically, we, at the Logistics Management Center, contribute to this portion of the Journal. Our last contribution appeared in the Summer 1982 edition. Many of the projects that were in that listing have been completed, and we sincerely hope the Air Force Logistics community is more efficient because of them.

The cooperative efforts outside of the Center have been outstanding. Students and faculty members at Air University and the Air Force Academy provided significant inputs to our projects. Other personnel from MAJCOMs and bases have helped us by providing "real world" data; test-bed sites; survey participants; "sounding boards" for new approaches; and, in several cases, key recommendations on better ways to solve logistics problems.

If you are interested in any of these projects, please contact the project officer. If commercial lines are used, dial Area Code 205, 279-plus the last four digits of the AUTOVON number.

Current Projects

Interactive Pallet Loading System (IPLS)
Objective: Develop a fully operational palletization module for incorporation into the deployable mobility execution system (DMES).
(Capt Cameron, AFLMC/LGX, AUTOVON 446-3355)

Combat Logistics System (CLS)
Objective: Convert the base-level contingency operations mobility planning and executions system (COMPES) from a punched card, mainframe system to an interactive, deployable system.
(Maj Stewart, AFLMC/LGX, AUTOVON 446-3355)

Mobility Operations Base-Level LOGMARS Enhancement (MOBLE)
Objective: Streamline base-level mobility operations and management. Implement system Air Force wide.
(Maj Snyder, AFLMC/LGX, AUTOVON 446-3355)

Logistics Reception Planning System
Objective: Improve logistics reception planning through the following two phases: (1) Develop a system for managing contingency logistics reception information and planning in the manual mode. (2) Develop an Air Force-wide system for planning and actually bedding down forces supporting contingency combat operations.
(Maj Holland, AFLMC/LGX, AUTOVON 446-3355)

Mobility Control Center (MCC) Productivity
Objective: Investigate and evaluate the need for standard Air Force operations guides, training, automated data system, etc., to increase the efficiency and effectiveness of the MCC during mobility processing.
(Capt Grandalski, AFLMC/LGX, AUTOVON 446-3355)

LCOM Capability Assessment Model of Munitions Productions
Objective: Create and exercise a model of the munitions support for a deployed A-10 squadron. Four specific issues will be addressed: (1) Resources needed to support a scenario based on the USAFE supplan 4409 planning factors. (2) Capability of the unit, given the resources it will take with it, when tasked under the 4409 scenario. (3) Resources needed to support a scenario based on planning factors from the war and mobilization plan, Vol 5 (WMP-5). (4) Capability of the unit, given the resources determined in issue 3, when tasked under the 4409 scenario.
(Capt Taylor, AFLMC/LGM, AUTOVON 446-4581)

Interactive Computer Assisted Instruction (CAI)
Objective: Evaluate CAI system to determine if it is more effective and cost beneficial over conventional unit-level OJT methods.
(Capt Albright, AFLMC/LGM, AUTOVON 446-4583)

Needs/Application of Source Data Automation (SDA) to Aircraft Maintenance
Objective: Determine the needs and areas of application within the aircraft maintenance environment for automated source data entry. Evaluate source data entry devices and equipment against the needs and specific applications.
(Capt Racher, AFLMC/LGM, AUTOVON 446-4581)

Maintenance Scheduling Research
Objective: Improve the scheduling of maintenance resources through the development of an automated scheduling aid which: (1) allows maintenance schedulers to input their own rules; (2) interacts with the scheduler in developing short- and long-term schedules; and (3) allows easy experimentation, temporary rule changes, and system override. The prototype should: (1) apply to large homogenous aircraft fleets; (2) require little or no additional ADP investment; (3) interface with MMICS; and (4) provide accurate, rapid scheduling and rescheduling of maintenance and flying events.
(Capt Turner, AFLMC/LGM, AUTOVON 446-4581)

Base-Level Incentive Contracts
Objective: Develop incentive contracting arrangements to improve the quality of performance under services contracts.
(Capt Lail, AFLMC/LGC, AUTOVON 446-4085)

COPPER 90
Objective: Describe how the base-level contracting office of the 1990s will look and work.
(Lt Col Porth, AFLMC/LGC, AUTOVON 446-4085)

Microcomputer Applications Within the Standard Base Supply System
Objective: Evaluate applications of microcomputer technology within the standard base supply system (SBSS).
(SMSgt Nichols, AFLMC/LGS, AUTOVON 446-4165)

Supply Facilities for Austere Locations
Objective: Examine, document, and validate old and new type portable structures for combat supply activities supporting one, two, or three squadrons.
(Mr. Edwards, AFLMC/LGS, AUTOVON 446-4165)

Combat Supply Procedures
Objective: Examine AFM 67-1 and other supply related directives to ensure that the chief of supply has a document which is usable in the combat zone.
(Mr. Edwards, AFLMC/LGS, AUTOVON 446-4165)

Contingency Base Support Requirements Forecasting
Objective: Examine the D+60 requirements techniques and develop/recommend a requirements technique to support wartime forces.
(Capt Ogan, AFLMC/LGS, AUTOVON 446-4165)

Hazardous Materials Training
Objective: Provide clear, concise guidelines to determine who should receive training in transporting hazardous materials, what the training should include, how often it is required, and what medium is most suitable.
(Capt Dalton, AFLMC/LGT, AUTOVON 446-4464)

Transportation Workcenter Handbook
Objective: Provide junior transportation officers at base level a reference guide for management of a transportation branch. The handbook will describe major functional areas and offer some insight into what to look for and what to avoid in the management of those areas. It will provide the transporter with a framework of basic knowledge organized and presented in a manner not available in regulations.
(Capt Walker, AFLMC/LGT, AUTOVON 446-4464)

Logistics Capability Assessment
Objective: Develop a model for measuring the total war-fighting capability of an Air Force base. This model will include all pertinent interactive activities to allow for comprehensive measurements of a base's capability.
(Maj Cochard, AFLMC/LGY, AUTOVON 446-3514)

Policy for Small Computer Applications
Objective: Develop a reasonable policy for managing logistics applications of small computers throughout the Air Force and establish a means of sharing developed applications among diverse users.
(Capt James, AFLMC/LGY, AUTOVON 446-4524)

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Notes

[1] Dawson, David D. *Improving Readiness: A Cost-Effective Approach*, unpublished master's thesis, Air Force Institute of Technology, Wright-Patterson AFB, Ohio, January 1978.

[2] "Measurements of Military Essentiality," Report on TASK 72-3, Logistics Management Institute (LMI), August 1972.

[3] Sherbrooke, C.C. *METRIC: A Multi-Echelon Technique for Recoverable Item Control*, RM-5078-PR, Rand Corporation, Santa Monica, California, November 1966, p. 14.

[4] Genet, Russell M., Thomas D. Meitzler, and Capt Gordon Spray. *Logistics Investment Screening Technique Applied to Increasing Aircraft Availability for Offensive Air Support*, Final Report, Aeronautical Systems Division (ASD/XR), Wright-Patterson AFB, Ohio 45433, December 1977.

The Spares Segments - Are Changes Needed?

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Abstract

The spares segments presently used have been the source of much confusion and criticism both inside and outside the Air Force logistics community. As a result, controversies have developed that make it difficult for the Air Force to present and defend a coherent spares support program. The underlying issues involve the need for the present number of spares segments and the names applied to those segments. This paper reviews the background of the issues and discusses the current situation. It concludes that, while some refinements are needed, the system of spares segments now in existence within the Air Force has the structure and flexibility necessary to meet both peacetime and wartime requirements and should be retained. The segment names, however, should be changed to become more descriptive of their intended purposes.

Background

"No matter how large our forces or how modern our military equipment, if our forces are not ready to fight, or if they cannot be sustained once engaged, we have no real combat capability" (4:I-28). These words were used in the Secretary of Defense's annual report to Congress (FY83) to develop the idea that a balance must be maintained between force modernization and support of existing forces. Amplifying on how to do this, the report says that a major objective of our logistics program is to "ensure that the materiel readiness and sustainability of our forces are consistent with national defense policy" (4:III-149).

The ready availability of spares, repair parts, and related maintenance supplies is fundamental to readiness and sustainability. These items, referred to simply as spares, have traditionally been divided into a number of categories, or segments, for identification and ease of management. Spares designated for the support of day-to-day mission requirements are called peacetime operating stocks (POS) and are located at depots (wholesale level) and bases (retail level). Spares needed in addition to POS to support expected wartime activity are called war reserve materiel (WRM) and are further divided into subsegments. The WRM subsegments are war readiness spares kits (WRSK), base-level self-sufficiency spares (BLSS), follow-on spares kits (FOSK), other war reserve materiel (OWRM), and the war consumable distribution objective (WCDO). All WRM subsegments, with the exception of OWRM, are located with the users at the bases; OWRM is stocked at the depots. (See Table 1 for more complete definitions of the spares segments.)

The spares segments presently used have been the source of much confusion, misunderstanding, and criticism inside and outside the Air Force logistics community. As a result, controversies have developed that make it difficult for the Air Force to present and defend a coherent spares support program. Many underlying issues which involve naming and numbering spares and their segments have restrained development. Until these issues are resolved, it will be impossible to attain our desired readiness and sustainability objectives.

To understand the present controversies, we must look at some background issues. First, over the years, the various spares segments have evolved independently. No master plan was developed to tie the segments together; consequently, major inconsistencies resulted. During the past four years, however, these have been worked out through policy changes, but existing conceptions and misconceptions are not easily or quickly changed. Second, the names used for the spares segments in the Air Force also evolved independently. They include a mix of Air Force (AF) and Department of Defense (DOD) terms. In most cases, these names are not descriptive of the segments' intended purposes, thus adding to the confusion.

Number of Spares Segments

"Why do we have so many spares segments?" This question is often asked during briefings where the audience has just been bombarded with the entire WRSK, BLSS, FOSK, POS, OWRM, WCDO alphabet soup. Another popular question that generally follows before the first can even be answered is, "Why not simply have one segment or stack of spares and eliminate all the confusion?" My answer to these questions is simply that our present spares segments are designed to do specific, necessary, and different functions that could not be easily performed with fewer segments.

An approach that I have found useful in evaluating the need for the present spares segments is to look at the situation as if we were starting afresh. That is, if we could start over today, what kinds of spares segments would we build? To answer this question, we must look at the fundamentals of supply and also answer correlative, and more basic, questions: What are we trying to do? Under what conditions will we be operating? And how much flexibility is needed?

Supply Fundamentals

In order that we can better understand the more complex spares segments issues, we should consider some of the applicable supply fundamentals. First, and most important, the basic objective of supply operations is to have the *right* spare at the *right* place at the *right* time to support the mission. Implicit in this objective is the need for the spare to be in a serviceable condition. Also, since there is always a degree of uncertainty involved, an acceptable level of risk for not having the spare must be established. Further, since money is a scarce commodity, things must be done economically. Therefore, spares segments must be configured and located in a manner that, within acceptable risk and economic constraints, will result in available serviceable spares.

There are two basic logistics facts that, although implicit in the above, are often overlooked. These facts (which I prefer to call principles because of their comprehensive and fundamental nature) refer to the relative utility of spares resulting from their condition and location. That is, a serviceable spare at the point of need is of greater value than an unserviceable spare, and a serviceable spare at the point of need is of greater value than a serviceable spare at another location. These principles may be expanded, as necessary, to include the relative values of serviceable and unserviceable spares at various locations. The reason I have emphasized them will become clearer as I develop my case concerning the numbers of spares segments needed.

What Are We Trying To Do?

Our overall objective in military logistics is to provide for the peacetime readiness of our forces and, if necessary, to sustain those forces in combat. Readiness, as defined by the Organization of the Joint Chiefs of Staff (OJCS), is "the ability of forces, units, weapon systems, or equipments to deliver the output for which they were designed" (2:51). From a spares perspective, this means supporting day-to-day training requirements while maintaining sufficient combat capable weapon systems to deter our enemies. Should deterrence fail, our forces must have sufficient spares in the *right* condition and at the *right* location to sustain them until effective resupply is established.

Maintaining peacetime readiness is a difficult task because of the complexity, diversity, and constant state of change characteristic of our weapon systems. Having the capability to sustain our forces in wartime, however, presents an even greater challenge. The large numbers of different types of forces and missions involved, the deployment requirements for those forces, and the many, scattered beddown locations from which those forces must operate in wartime are but a few of the factors that make wartime support difficult.

In addition, some of those locations may not be known in advance, the distances over which resources must be moved may be great, and competition for our limited transportation resources may be keen. Add to this a hostile environment, degraded communications, and an ever-changing order of battle, and the complexity of providing wartime spares support becomes even more apparent. Because of this, determining spares requirements is very difficult. Furthermore, we have had to live with financial constraints over the years. As a result, we have not reached our support objectives. According to the OJCS, "Logistic support of dispersed forces continues to be a major constraint on the ability to meet US military objectives" (2:99).

Under What Conditions Will We Be Operating?

If we accept the failure or consumption patterns of individual spares as given, four major factors remain that will influence the type and level of spares support needed to accomplish assigned missions with a particular confidence level of success. These factors are the unit's activity level, operating location, maintenance capability, and resupply timing. We must evaluate each of these factors from the perspective of change. Specifically, is the factor relatively stable or dynamic in the various operating conditions under which a unit may be tasked to operate? In present planning scenarios, these operating conditions may be categorized as peacetime, transition to war, and wartime.

Looking at peacetime operating conditions, we see that the four factors of concern are relatively stable for most units. Activity levels are reasonably constant throughout the year; the units generally operate from fixed bases or along a fixed route structure (deployment exercises are an exception to this stability); the units' maintenance capabilities are constant; and resupply has few serious interruptions. Given this relative stability, spares levels can be established to support peacetime operations and readiness at any reasonable level. This situation is the basis for the present spares segment, POS.

What would happen if we transition our combat units from peace to war? To answer this question correctly, we must consider separately those units that fight in place and those that must deploy to fight. The fight-in-place units are easier to handle because fewer changes take place. By definition, these units will continue to operate at the same location. Also, they will continue to have the same maintenance capability they had in peacetime. Changes in the other two factors, however, are likely to be very dynamic. In most situations, the unit activity levels will increase sharply, and resupply from the normal stateside supply sources will be interrupted.

Such increases in activity levels and interruption of resupply spares would make it necessary that spares, in addition to those needed for peacetime support, be collocated with the units or, as a minimum, be stocked within the theater of operations. The latter option, however, would require assured logistics transportation and communications similar to that envisioned for the proposed European Distribution System. Under present concepts, most of these additive spares requirements will be stocked with the units as BLSS authorizations. Additionally, some support will be provided from WCDO stocks prepositioned in the theater of operation to support both fight-in-place and deployed units.

Units that deploy to fight will be confronted with the same activity level and resupply dynamics as the fight-in-place units. That is, in most situations, wartime activity levels will be much higher than those experienced in peacetime and resupply will be interrupted. What happens with the other two factors, however, is markedly different. First, the unit's operating location will change. Second, the unit's maintenance capabilities will decline, at least temporarily, while its deployable equipment is moved and set up at the new operating location. This decline is greatest when the unit's equipment is deployed incrementally over a period of a month or more (the most common method for aircraft units) or when some or all of the unit's equipment is not deployed.

The spares required to support the mission tasking of deployed units must be tailored to both the units' planned activity levels and maintenance capabilities. Further, since neither initial spares support nor resupply from stateside depots will be immediately available, spares must be either deployed with the units or prepositioned in theater at a point accessible to the units' beddown locations. Under present concepts, each unit that deploys will have a WRSK in its deployment package. For those units that later deploy additional maintenance equipment and personnel, an FOSK will be included in that follow-on maintenance package. The FOSK will contain a full range of spares to augment the WRSK assets and will support planned operations until effective resupply can be established. As mentioned earlier, deployed units will also be supported at certain locations by prepositioned WCDO stocks.

So far, I have outlined spares support requirements where everything happens as planned. Experience shows us, however, that under the friction of war, this may not always be the case. Since the lack of repair parts can keep aircraft on the ground and shut down other combat capabilities, we cannot ignore the impact of bad luck and war-induced catastrophes. Our ability to minimize losses and respond quickly to those that do occur will influence the overall design of our spares support system, its various segments, and ultimately the spares requirements themselves.

Establishing Flexible Resupply

While the spares located at the retail level presently constitute the primary source of support during the early or transition stages of a war, continued support is dependent upon establishing effective resupply of wartime operating levels from stateside sources. The resupply system must be working before the units and in-theater stocks have been depleted to the point where sustaining planned activity levels is no longer possible. (It should be noted that during a general war, WRM assets are to be combined with peacetime stocks and used as operating stocks to support wartime operating levels.)

Along with theater operations, depot repair and resupply must continue to support the residual stateside activity, including airlift and other strategic and air defense forces, while responding to emergency in-theater requirements and preparing for sustained wartime support. Performing these functions will require stocks, in addition to POS, to bridge the gap between the start of a conflict and the point in time that industrial mobilization is complete. These additive stocks under the present system are OWRM and are stocked by the wholesale manager of the item.

In addition to POS and OWRM, depots have recently been authorized to develop BLSS packages containing spares not stocked as OWRM at their depots but needed to support their repair activity. As with BLSS at the retail level, this prepositioning technique simply distributes items needed for anticipated wartime use. The objective is to assure continuous repair line operation during the turbulent initial days of a war, when spares support from outside agencies is likely to be interrupted.

The above discussions highlight the wide range of conditions under which units need to be supported in war. The present system provides several different types of spares segments to provide this support. Each segment has different characteristics and is specifically designed to provide support under a specific set of conditions, such as peacetime readiness and wartime sustainability. Those segments offer a wide range of options that allow management flexibility in working support problems. But how much flexibility is needed?

Is there a need for a separate POS segment? Why not have a single stockpile based on wartime needs? First, using wartime activity as the sole factor in determining support requirements does not always work. For some units, peacetime activity is greater than wartime activity; some units use a different mix of assets in wartime; and maintenance capabilities in war and peace may differ. Also, it would be difficult to ensure that items comprising this single stack stay in the right condition and location to support wartime operations. Second, if peacetime support is not controlled, it could absorb almost limitless resources. The POS concept provides a means for establishing efficient operating limits and managing operations within those limits. Use of the POS concept therefore helps ensure that our levels of resources are consistent with both our readiness objectives and operational efficiency.

The major WRM issues are mobility and location. The timely movement of spares to meet wartime deployment tasking requires much preparation. A unit's specific item needs must be determined in advance, and assets must be assembled in a configuration that allows both efficient movement and accessibility to the spares upon arrival at the deployed location. The present WRSK and FOSK concepts sufficiently accommodate these needs for initial deployments and follow-on maintenance deployments.

Where unit mobility is not a factor, the situation involves decisions on stockage location. The options provided by the current system include stockage with the fight-in-place unit to support its activity (BLSS); stockage in theater to support the activity of both the in-place and the augmenting forces (WCDO); or stockage at the wholesale depots to support resupply (OWRM). Current segments provide a full set of options to accommodate expected activity levels, storage location vulnerabilities, and resupply assumptions. No other options are needed, and fewer options could not do the job. (See Figure 1 for a visual of the WRSK/BLSS/WCDO/FOSK interface in a theater.)

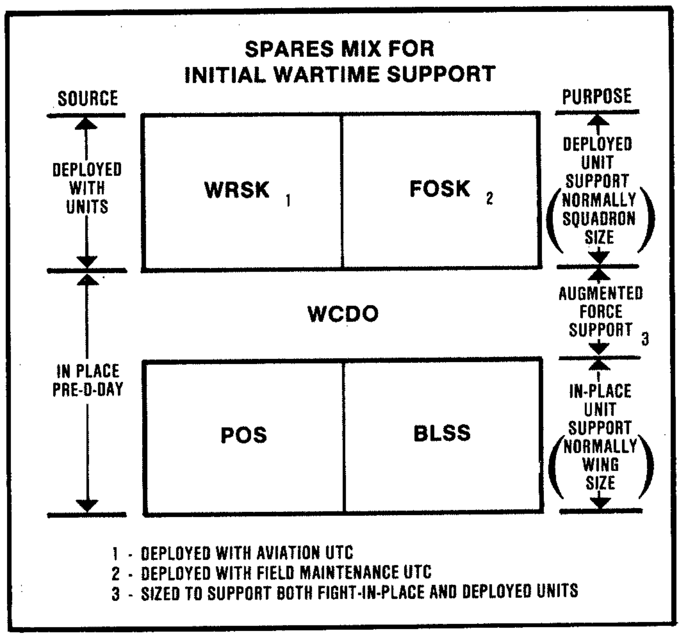

Figure 1.

What Should the Spares Segments Be Called?

While I support the need for the present segment structure, I strongly believe that certain fundamental name changes are required. The segment names now in use have caused much confusion and many misunderstandings. Several of the words used in the segment names are used incorrectly, have double meanings, or act as flag words. Some examples follow:

> "War readiness spares kits" are not intended to make a unit ready for war but rather to sustain it in combat.
>
> The term "reserve," although a technically correct word for what is being described, tends to convey the idea of something extra or unnecessary.
>
> The term "other" in other war reserve materiel amplifies the above misinterpretation of the term "reserve" and makes that segment sound even more unnecessary.

"Peacetime operating stocks" does not convey its intended purpose—defense readiness.

The term "war" is a flag word wherever it is used.

Rather than perpetuate the above inconsistencies, I suggest that we bring the names of the spares segments in line with the Department of Defense readiness and sustainability definitions and objectives. By current definition, readiness is the ability to deliver designed combat output when and where needed, and sustainability is the ability to sustain, if necessary, that combat output in war (4:I-28). Using these definitions as guides, we should rename the spares segments to correspond more exactly with the functions they serve. **I propose that POS be renamed "defense readiness spares," a subset of "defense readiness materiel," and that WRM spares be renamed "combat sustainability spares," a subset of "combat sustainability materiel."** The defense readiness spares could be divided for management and control purposes as POS is today, using subsegments such as base levels, depot levels, pipeline quantities, etc. The combat sustainability segment would be divided in a functional manner similar to that used for WRM today. The segment names, however, would be more descriptive of the location and purpose of the spares they represent. I propose the following new names for the current WRM subsegments:

Base oriented sustainability spares (BOSS) - current BLSS
Theater oriented sustainability spares (TOSS) - current WCDO
Depot oriented sustainability spares (DOSS) - current OWRM
Mobile initial sustainability spares kit (MISSK) - current WRSK
Follow-on sustainability spares kit (FOSSK) - current FOSK

Note that the term "spares" could be changed to accommodate other types of readiness and sustainability materiel such as munitions, equipment, fuels, etc. Regardless of the specific terms used, I believe that some terminology changes are needed--and soon.

The Last Word

The system of spares segments now in existence within the Air Force has the structure and flexibility necessary to meet both peacetime and wartime requirements and should be retained. The present number of spares segments is needed to describe, by condition and location, the spares required to support day-to-day peacetime operations and specific wartime scenarios. Past inconsistencies among the spares segments have been eliminated by recent policy changes. The segment names, however, should be changed to become more descriptive of their intended purposes. Although major changes are not needed, we all must take the time to understand the system we have and use it properly--it will do the job!

References

1. The Joint Chiefs of Staff. JCS Pub 1: *Department of Defense Dictionary of Military and Associated Terms*. Washington: GPO, 1 June 1979.
2. The Organization of the Joint Chiefs of Staff. *United States Military Posture for FY 1983*. Washington: GPO, 1982.
3. U.S. Air Force. Air Force Regulation 400-24: *War Reserve Materiel Policy*. Washington, 28 November 1979.
4. Weinburger, Caspar W. *Report of Secretary of Defense, Caspar W. Weinberger, to the Congress on the FY 1983 Budget, FY 1984 Authorization Request, and FY 1983-1987 Defense Programs*. Washington: GPO, 1982.

Base-level self-sufficiency spares (BLSS) - (AF). WRM spares, repair parts, and supplies intended to support increased wartime activity for units which operate at their assigned peacetime base location. When operationally and economically feasible, a BLSS may be prepositioned to support a deployed unit at a forward operating location. (3:A-2)
Follow-on spares kits (FOSK) - (AF). An air transportable package of selected WRM spares, repair parts, and supplies, and like peacetime operating stocks intended to deploy with a follow-on maintenance capability and sustain planned wartime activities for a specific period of time. (3:*)
Other war reserve materiel (OWRM) - (DOD). The war reserve materiel requirement less the sum of the prepositioned war reserve requirements. (Prepositioned war reserve materiel items are located at the base level and are generally positioned at or near the point of planned use. OWRM assets are located at the depots.) (1:249)
War consumable distribution objective (WCDO) - (AF). A document prepared by AFLC to provide the WRM prepositioning requirement for selected war consumables for support of the wartime activities reflected in the USAF WMP. (This term is also used to describe the physical resources prepositioned as a result of publication of the WCDO document.) (3:A-3)
War readiness spares kits (WRSK) - (AF). An air transportable package of selected WRM spares, repair parts, and supplies required to sustain planned wartime or contingency operations for a specific period of time. (3:A-3)
War reserve materiel requirement (WRMR) - (DOD). The quantity of an item, in addition to the M-day force materiel requirement, required to be in the military supply system on M-day in order to support planned mobilization, to expand the materiel pipeline, and to sustain in training, combat and combat support operations, as applicable, the approved United States force structure (active and reserve) and those Allied forces designated for United States materiel support, through the period and at the level of support prescribed for war materiel planning purposes. (1:370)

* This FOSK definition is from a revised version of the AFR 400-24 now in publication.

Table 1: Definitions.

Opportunities for Increased Operational Effectiveness Using Information Technology

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Background

Operational leaders in today's Air Force have the opportunity to use emerging technologies to enhance their decision making, free them from time-consuming tasks, and improve their accuracy in dealing with increasing amounts of information in many forms. However, the opportunity is two-edged: proper use will result in unprecedented force enhancements, while improper use could permanently frustrate future Air Force leaders. The opportunity is based on miniaturization which made intercontinental ballistic missiles (ICBMs), space flight, and airborne inertial navigational systems possible.

Alternately, these same technologies also raise the specter of an uncontrollable morass of information. Without proper planning, each element may benefit by performing some of its mission more efficiently, only to become bound up in technological incompatibilities with other elements. This could result in financial burdens and equipment "kludges" (equipment that is mismatched, dissimilar, and subobtimized). Added to these concerns is the overriding consideration that each critical system must provide vital capabilities during hostilities, either in a garrisoned or deployed environment. This may dictate manual backups or equipment redundancies.

Applications vary from the individual systems in the smallest operational unit to multiple systems encompassing MAJCOMs and the Air Force. Additionally, many applications have operational implications. In short, implementation of these technologies is affecting, and will continue to affect, the Air Force in the most fundamental ways. It is a revolution! The Air Force will never again be the same.

Although our weapons systems contain nearly 50,000 computers,[1] miniaturization and the attendant hardware cost reduction have only recently made them available for our use. The number of Air Force computers, exclusive of hand-held calculators, word processors, and those integral (embedded) to weapon systems, will nearly double in the next two years (from approximately 2,000 in 1981).[2] This same technology is also advancing a complementary capability—electronic communications.

Current and Potential Applications

Potential applications of the information technology exist in the Air Force at all levels: units, MAJCOM/SOA headquarters, and the Air Staff. At each level, three elements (executive, crew member/action officer, and clerical) need these applications. The executive needs accurate and complete information available in a timely fashion to make decisions. The crew member/action officer needs tools to manipulate, process, and analyze data, and to distribute and recall information to satisfy mission requirements. Action officers and clerical personnel need tools such as schedule planning, document transfer, word processing, and electronic mail to provide required support in an era of austere manning.

To be operationally attractive, systems that incorporate advances in information technology must improve areas of productivity, accuracy, and timeliness. They must also be able to perform some tasks that currently cannot be accomplished due to time constraints or deficiencies of current systems. From an operational perspective, this should translate into increased combat capabilities and effectiveness. Systems to improve mission effectiveness in operations, logistics, personnel, and other functional areas will be implemented and interconnected. Capabilities in areas such as training, flight planning, scheduling, and aircrew/aircraft management will be improved by applications that include automation of NOTAMs (Notice to Airmen), reference material, crew instruction in areas such as dash-l's (aircraft technical orders), war plans, trend analysis, and combat mission data. The unit will develop a structure to support continuing operations and information flow in the unit as well as to higher headquarters. New systems will implement needed improvements in information data capture to increase accuracy and decrease duplication of efforts. Force management systems based on new technologies will be developed to manage information to support wartime, crisis, and peacetime missions. Perhaps most important of all is that these systems, due to their small size, can deploy with the operational units.

Personnel at the unit level may be the biggest beneficiary of new information technology applications. Table 1 depicts some possible representative savings using new technology.

Flight planning[3]	50% time savings
Weapons planning[3]	50% time savings
Scheduling[3]	30-50% time savings
Navigational training[4] (remedial and additional training)	5% fuel savings

TABLE 1.

Some commands can increase their readiness by conducting a portion of their navigational continuation training by computer, thus using the flying time for training in other critical areas. The key is that these systems are being implemented at the unit level to support unit personnel. This, in turn, permits information required by higher headquarters from the unit to be made available without further inputs.

Table 2 cites some examples of application at the MAJCOM/SOA level.

Access to critical data bases (force status, budget, personnel, etc.)
Electronic distribution/coordination of documents and packages
Electronic messaging and mailboxing
Graphics/modeling
Data processing
Information storage and retrieval
Suspense and project status monitoring
Text processing
Making viewgraphs
Scheduling
Training
Teleconferencing

TABLE 2.

These applications and capabilities must be tailored to assist the particular user. Each application must have easy-to-use instructions to allow the user access to any authorized information available. The productivity of the users will be further improved by providing connections to the Air Staff and subordinate units to collect, exchange, and compare information. The examples of potential applications listed above are also applicable for the Air Staff. However, the information used will often be less detailed than that used at the MAJCOM/SOA headquarters. Connections will also be provided to other DOD agencies and data networks. Time saved will vary with each headquarters; however, savings of 10% to 30% have been documented for action officers,[5] This time can be used for other productive endeavors.

In addition to the benefits already cited, local area communication networks at each level should allow easy access to authorized information. This should reduce the requirement to maintain the information at several different locations on the installation.

Perhaps the most difficult concept to grasp is the synergistic effect that is possible with these improved capabilities. This will be realized in two ways: the application of individually developed programs applied universally and the analysis of information from programs designed for individual use to improve unit mission effectiveness.

Many of these applications are already being implemented, as leaders at all levels within the Air Force realize the potential benefits of the new technology. From Squadron Commander to the Office of the Chief of Staff of the Air Force, Air Force leaders are initiating programs to improve the productivity of their people and increase mission effectiveness. Some applications of small computers in operational units are shown in Table 3.

Information Technology Problem Areas

Information problems, from the traditional acquisition difficulties to those associated with new concepts and ideas, must be worked with the focus on overall Air Force information management requirements. This focus is needed to reduce unnecessary duplication and development time, while providing the standards necessary for lateral and vertical information exchange.

Flight/fuel/load planning
Takeoff/landing/flight data computations
Weapons laydown computations
Flight scheduling
Trend analysis
Gunnery/weapons delivery scores
Gun camera film assessment
Order of battle management
Combat mission data
Composite force management/tactical scenario gaming
Data communications
Personnel rosters
Flying hour/training data
Information storage/retrieval
Suspense management/calendars

TABLE 3.

One category of problems involves system acquisition. The Deputy Secretary of Defense has recognized that problems exist within the acquisition process and is determined to seek improvements. As part of this effort, DOD regulations and directives are being reviewed in order to reduce acquisition lead time.

The second category involves system related problems; e.g., requirements, financial planning, interoperability, and supportability. To design, size, configure, and fund an information system, the users must adequately state their needs based on a full understanding of their organization's use of its information. Therefore, a continuing interaction between the user and the developer in documenting/interpreting the requirements is needed throughout the development and installation phases.

While rapid advances in information technology have greatly reduced the costs of the computer hardware, the purchase of large numbers of computers, local area networks, and related equipment is still expensive. True costs, however, may be better measured by the lost opportunities and inefficiencies of not using these technologies.

Interoperability is increasingly important as new technology becomes available to satisfy the requirements for distributed processing and information sharing. One key to interoperability is source selection. System interoperability must be considered prior to selecting a source. Once a source has been selected, system upgrading and interoperability may be severely restricted by the characteristics of the selected hardware and software. A second key is standardization. Appropriate standardization policies and practices must be implemented if information is to be properly managed, stored, transmitted, and processed to meet multiple user needs. However, standardization should not be so rigid as to stifle innovation or greatly hinder the ability to use these technologies.

Supportability, another system related problem, involves both software (applications programs) and hardware (equipment). The cost of developing and maintaining software is growing rapidly and often exceeds the cost of the hardware.

This financial burden can be reduced by the use of available commercial and Air Force standard application packages, by system design and source selection which encourages the users to generate and share their own applications, and by the implementation of procedures which ensure adequate documentation to correct, modify, and replace application packages. The second part of supportability, hardware reliability and maintainability, directly affects system utilization. System design, maintenance philosophy, and source selection must be based on the operating environment to reduce maintenance downtime and increase system utilization.

A third category of problem areas is psychological factors, a broad and sensitive area that actually begins at system concept and continues for the life of the system. Implementation of new programs requires strong support from high level management and sensitivity to personnel affected by change. This support is needed to overcome the natural fear and resistance to change, the emphasis on today's "brush fires," and the need for "job security."

Security is another significant problem area because a large portion of the data we use is classified. If the full potential of our automated systems is to be achieved, they must be capable of handling classified data. This means, first of all, the equipment must be TEMPEST certified. That is, the devices must have been tested and shown to have sufficiently low electromagnetic emanations so as to preclude it being picked up by a clandestine receiver. Some TEMPEST certified devices are on the market now, but their prices can be three to four times higher than similar uncertified equipment. The interest in TEMPEST by the civilian community and an increasing number of vendors offering the capability should help bring the price down.

TEMPEST alone, though, does not totally solve the security problem. Information must be moved from one location to another; and, to do so, it must be protected. This can be accomplished in many ways, including protected wires, hand-carrying, or encryption.

Encryption probably offers the best, long-term solution to the problem. Hand-carrying can be too slow and protected wire too expensive. Information can be encrypted off-line or, in the case of a local area network, on-line, and then transmitted. The National Security Agency (NSA) is working on programs to handle both types of encryption. Off-line encryption may be available in the near future; however, local area networks encryption will probably not be available until the end of the decade.

By using TEMPEST equipment, we can process classified data in the work place today. Transmission of that data, however, will continue to be a problem area for many years to come; so we must be on guard to ensure that improper use does not lead to a compromise of classified data.

Information Technology — Policy Considerations

Air Force policies on information management must facilitate the effective application of information technology as a force multiplier. Policy considerations for implementation of information systems can be viewed from three perspectives: management philosophy, standardization, and the environment.

In January 1982, the Air Force DCS for Plans and Operations requested[6] the views of major commanders relating to information management initiatives within the Air Force. The responses[7] expressed a need for coherent information policies, an overall architectural design for the development of information systems, Air Force development of standard interfaces (operating systems programming languages, etc.), and for information to be managed as a resource. Policies, reflecting these needs, are being developed in the Air Staff; e.g., a Small Computer Policy[8] has been drafted and forwarded to all MAJCOMs and SOAs for comment.

Systems developed to satisfy information needs in the Air Force must recognize that the interoperability aspect of standardization extends beyond the unit, MAJCOM, and Air Force level to non-Air Force components and to non-DOD components. Therefore, new or modified systems should contain the hardware, software, and communication protocols necessary to ensure interoperability. However, policies and procedures implemented to accommodate standardization should emphasize that it is a tool to serve the user and is not the absolute answer.

With the onset of the microcomputer systems and their associated portability, policies must be implemented that ensure the new systems will work in any environment—whether in the squadron, office, or on the flight line. Contingency policies and procedures, based on a feasible maintenance and logistics concept, should be developed and tested to ensure the availability of automated support when needed.

Information system policies should encourage periodic user conferences, establishment of user groups, application clearing houses, and personal involvement of the commanders. These policies will encourage standardization and increase system utilization by user exchange of "lessons learned," new ideas, and locally developed applications programs, while increasing user awareness of the impacts of automation. This increased knowledge will, in turn, result in new policies to better control and direct implementation of information systems to maximize their benefits and minimize their deficiencies.

Summary

The technology to free operational personnel from the tedious and mundane, but necessary, record-keeping tasks is available today. Its implementation will require careful planning and thought; however, the potential payoffs appear very promising—far beyond record keeping. The potential applications and utility are limited mostly by our imagination.

On the other hand, these technologies must be introduced carefully. Their loss in a combat environment could greatly hinder operational capabilities unless adequate planning has been done. A deliberate approach, with the operational users' eyes wide open, seems appropriate.

Notes

1 Clear Case for Office Productivity, page 17, Data Processor, December 1980.
2 AF/XO-I Computer Cost Study, 3 August 1981.
3 Estimated future savings provided by 51 COMPW OSAN AB Korea.
4 Conversations between personnel in AF/XO-I and those in HQ MAC and HQ SAC.
5 AFSC/ESD report, Project Impact AFOSR Field Test, 30 November 1981.
6 AF/XO letter, Information Items, 22 Jan 1982.
7 The MAJCOMs and Agencies also requested: (1) HQ USAF policy to reconcile the fact that computers can be acquired to support a variety of functional ends; (2) an overall plan to reduce duplication and ensure compatibility to integrate Air Force information; and (3) support for local management of local requirements which meet Air Force standards.
8 AF/XO letter, Small Computer Policy, 5 Aug 1982.

The material for this paper was provided by members of the Office of Information Technology (AF/XO-I), DCS Plans and Operations, HQ USAF: Lt Col Larry N. Miller, Lt Col Scott Phillips, Maj Mark A. White, Maj Douglas Ferrata, Maj James S. Pagendarm, Maj David Cookerly, and Capt Janet B. Withrow.

Logistics History - A Plea

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"More than most professions, the military is forced to depend on intelligent interpretation of the past for signpost charting the future. Devoid of opportunity, in peace, for self-instruction through actual practice in his profession, the soldier makes maximum use of the historical record in assuring the readiness of himself and his command to function efficiently in emergency. The facts derived from historical analysis, he applied to conditions of the present and the proximate future, thus developing synthesis of appropriate method, organization, and doctrine."

General Douglas MacArthur

Introduction

The 1973 withdrawal of United States (US) troops from Vietnam ended our military involvement in the problems of that country. Since then, the military services have commissioned over 50% of their present officers. With the exception of those who served as enlisted members during the Vietnam conflict, these officers have no wartime military experience. The same is true in the noncommissioned officer (NCO) ranks, although it may not be as great. As these officers and NCOs mature and become senior military leaders, they are in the precarious position of making decisions about future wars without the benefit of first-hand combat experience.

Value of Military History

The study of military history will enable these leaders to develop a war-fighting perspective even though they may not have actually participated in warfare. In fact, Rear Admiral (Retired) Henry E. Eccles believes the best way to achieve experience is through actual combat; however, if this is not possible, the next alternative is through the study of history. In his view, "... knowledge of the continuing patterns of thought and behavior revealed by the study of history is essential" for those who presently, or will, exercise authority.

Although technology and the weapons of warfare have changed, some authorities feel "the broad principles of warfare are the same now as they were in the days of Hannibal and Alexander, and any military commander can benefit from the past." The rapidly changing technology of modern warfare requires adaptability, flexibility, and innovation from military leaders. History serves as a valuable aid to leaders when they are evaluating ideas and creating *new* methods to meet *new* situations.

Experience has revealed that the study of military history flourishes during the early stages of war. The records of World War I proved so valuable during the early campaigns of World War II that conscious efforts were made to preserve accurate and adequate records of events throughout the war. During a short-lived war, and its urgent need for delivery of resources around the world, the military system must efficiently and effectively transition from peacetime to wartime routine to ensure success.

Logistics History

Three fundamentals elements of war are commonly discussed by military historians: strategy, tactics, and logistics. Strategy is the methodological planning for mission achievement and represents potential. Tactics applies power in accordance with the dictates of strategy and is the methodology for implementing strategy. Logistics provides power by making supplies, equipment, and personnel available to execute the plans conceived in strategic planning. According to Eccles, "In all war situations, the actions and decisions of command, whatever the level, are based on a blend of strategical, logistical, and tactical plans." Although these elements are inextricably related, they are generally studied individually. Since strategy and tactics are considered more "exciting" than logistics, many military historians have forgotten to include logistics in their curricula.

It is important for military leaders to keep the interrelationship of strategy, tactics, and logistics in balance. For example, in 1942, artillery units landed in Africa prepared for battle, only to discover their supplies were on a ship returning to the US. This event indicates that neither strategy, tactics, nor logistics can function effectively independent of each other. While an understanding of the synergistic relationship among the three elements of war is important, it is equally essential for leaders to understand synergism in both the creation of military capability and the outcome of war.

A logistics perspective of military history is important. Leaders must know how the concepts, procedures, and principles of logistics have evolved so they can critically analyze, compare, and understand the current systems and processes.

The concept of logistics has been traced to Epaminondas, 326 B.C. However, it did not come into contemporary use until the early nineteenth century when the French theorist, Jomini, began espousing the use of the term. Although the US Civil War was the first "modern" war, World War I marked the real beginning of the "Logistical Era." The vast numbers of troops, the great distances involved, and the quantities and types of materiel required for global warfare highlighted the need for logistics planning and support. The military services then created special organizations to support their logistical needs.

Between the wars, logistics systems continued to grow. With military forces spread throughout the world, and a heavy allied reliance on the US industrial base for support, the concept of logistics developed real prominence in World War II. Field Marshall Wavell, who had been a soldier for 42 years, amplifies this point: "The more I have seen of war the more I realize how it all depends on administration and transportation (what our American Allies call logistics)." Thus, it became obvious the supplies required for global warfare could not be haphazardly scattered around the world and logistics planning was an essential element of war. As earlier shown, however, success was not always achieved by logistics planning.

The logistics systems of World War II were successful, but each military service realized that many in its officer corps did not possess adequate logistics knowledge. Therefore, each service began to reorganize its educational systems to provide formal training in logistics. The Navy undertook a longitudinal, retrospective study of the elements and tenets of logistics to gain an understanding of logistical processes. The Office of the Chief of Military History sponsored the Army Historical Series which dealt with strategy, tactics, and logistics in the US Army. And the Air Force created the School of Systems and Logistics to provide an avenue of education for Department of Defense, particularly Air Force, logistics managers.

Concurrent with the growth of the air and space forces, a technology boom began in the late 1940s which has accelerated into the 1980s with no end in sight. The new weapons in the inventory have created a need for flexibility and adaptability in military logistics. For example, the sophisticated electronics and computer technology in those new systems has markedly impacted acquisition, supply, and maintenance—all subprocesses of logistics.

The Time Is Now

Air Force leaders must be aware of how the logistics system operates and why. As Colonel (Retired) Fred Gluck, USAF, noted, "To understand the true nature of military logistics is to understand the preparing for and waging of war."

The logistics establishment spends more of the military budget than any other identifiable entity. Some experts say more than 50 cents of every military dollar is spent in a logistics related area. In addition, more people work within the logistics operations than any other field. The impact of logistics is felt in all military organizations, activities, and echelons of command around the world.

Presently, there is a need for more written material which explains the ideas, concepts, and doctrines of military logistics. There are now several books, studies, theses or dissertations, and articles in professional journals available on the history of logistics. But, since they only scratch the surface, they do not provide a sufficient basis for an effective study of military logistics. **Not only is military logistics unstudied, but so is military history.**

The Research Studies Institute conducted a study on teaching military history at American colleges and universities and concluded: "It is interesting to note that there is no course outside of special military academy courses devoted exclusively, or even primarily, to the history, strategy, tactics, problems, or impact of air warfare. Much can be learned from courses of this nature that would help explain the military-civil relationship; our universities need to do more.

One of the foremost writers in military logistics is Admiral Eccles. His book, *Logistics in the National Defense,* is the preeminent theoretical text dealing with military logistics and contains the first attempt to document the evolution of military logistics thought. His analysis serves as the hallmark for significantly influencing subsequent logistics writings. In a separate work, he observed: "Too many military men tend to be too contemptuous of theory and history. Too many become so preoccupied with hardware, weapons, money, and operating they fail to appreciate that history furnishes a most important guide to wise action."

Major General (Retired) Graham W. Rider, USAF, in his doctoral studies, noted that, since World War II, all the military services have spent a great deal of time and resources attempting to comprehend their logistics systems. He also stated that the military establishment must take advantage of the information gained from these studies to "improve military organizations so that we can effectively and efficiently accomplish our national purpose." Colonel Gluck supported this view by asserting that the present mediocre performance of the military logistics system is not due to a lack of effort but to a misunderstanding of the system. In his view, "The failure to create a standard concept of logistics has led to a lack of common understanding, to confusion, and subsequently to a less-than-effective logistics operation."

No one has yet written a comprehensive up-to-date history of military logistics. Several authors have covered the subject in the context of a chapter or two within their books. In the introductory remarks to his book, *Supplying War,* Martin Van Creveld remarked:

> Even the relatively few authors who have bothered to investigate this admittedly unexciting aspect of war have done so on the basis of a few preconceived ideas rather than a careful examination of the evidence.

A chronicle of US military logistics is available in *The Sinews of War: Army Logistics 1775-1953* by James A. Huston. Over half of this extensive work deals with twentieth century logistics of the Army and the Army Air Force (AAF). Huston reported the events and situations and examined the various methods for dealing with them. He "told the story" of logistics by relating such functions as procurement, supply, and transportation to the organization of the military logistics system.

Amid growing concerns that Air Force personnel working in the field of logistics did not have adequate training or knowledge of the concepts of logistics, the Air Force Institute of Technology (AFIT) embarked, in 1955, on a program to train logistics managers. That program became the charter for the School of Systems and Logistics which was to provide an educational program to assist the logistics manager in meeting the challenges of a constantly changing logistics environment.

A former AFIT Commandant, Major General Ernest A. Pinson, noted that weapon systems have grown in sophistication, thus compounding the problems faced by the logistics manager. He asserted that the mass of information available to logistics managers has made it essential that they be sufficiently educated to meet the challenges of a constantly changing environment.

There is a great need for military logisticians to study military logistics history in order to prepare for the future. Therefore, we plead with Air Force educational authorities to prescribe logistics history studies for logisticians in professional military education programs, AFIT programs, and other educational endeavors.

Most Significant Article Award

The Editorial Advisory Board has selected "Movement Control: Enhancing Contingency Resupply" by Major Gregory D. Stubbs, USAF, as the most significant article in the Summer 1983 issue of the *Air Force Journal of Logistics.*

Project Warrior

Project Warrior is a concept fomulated to create an environment where our people can learn from the warfighting lessons of the past and use that knowledge to better prepare for the future.

Logistics Warrior

Logistics Warrior is the contribution of your journal to help create that environment. Your suggestions are solicited.

LOGISTICS WARRIORS: Falklands Potpourri

". . . Here, the second unpleasant surprise awaited both companies as they closed on it. It was clear that the Argentinians were equipped with extremely effective night sights, which allowed them to shoot with uncomfortable accuracy. In fact, it transpired that they were far better equipped in this respect than the British. They had what are known as passive night goggles, a form of binoculars, U.S.-made, that give an appearance of bright daylight in the darkest of nights. (The British had a few dozen pairs; the Argentinians had hundreds.) 'A' Company, who had secured a steep ridge to the northeast of the summit, now found themselves pinned down from the direction of 'Full Back.' One soldier was shot dead by a sniper bullet through the head. There was clearly going to be no speedy advance."

"Argentinian resistance elsewhere that night was not so sustained. 42 Commando, on Mount Harriet, led by Lieutenant Colonel Nick Vaux, used their Milan missiles, with mortar flares illuminating the targets, as a means of eliminating machine gun nests. 'It was a pretty expensive way of doing it,' admits Vaux (each missile costs around $35,000), 'but our job was to get rid of them.'

Even so, advancing up the slopes of Harriet was a slow and bloody business.

Kim Sabido, the IRN reporter, who was watching the action, says: 'For a couple of hours it seemed as if it might all go wrong. Pinned down on the slopes by heavy machine gun and sniper fire, progress was painfully slow. I saw several men fall with bullet wounds, others were hit by flying fragments from the constant barrage of long-distance high-explosive shelling. The men in front of us were not giving up without a bitter fight.' "

"There were some amazing pieces of luck as the Guards moved forward. One platoon found an Argentinian communications cable and simply followed it until it led to an enemy trench, where a small unit of snipers was taken unawares. A guardsman, nineteen-year-old Richard Shaw, had three magazines in his top-left-hand breast pocket, which stopped a bullet. The blow knocked him over, throwing him back some ten yards. Shaw thought: 'I'm dying.' But he was unhurt. He still has the magazines. Kiszely himself had a compass hanging over his hip pocket, which took the full impact of a bullet and scarcely hurt him at all."

From: *War in the Falklands* by *The Sunday Times* of London Insight Team.

LOGISTICS WARRIORS: Incongruencies

"An American without fighter aircraft seems equally incongruous. As skeptics from George Pershing to Tom Wolf have inevitably learned, it is practically impossible to overestimate the cultural baggage Americans have tied to their fighter planes and pilots. Supersonic embodiments of the national fetish for high technology, they are as individualistic as the tank is corporate. And as such, they have thrived in an era of fiscal stringency leaving us with a variety of anomalies from a navy heavy on aircraft carriers and light on all other classes, to A-10 ground attack aircraft, rather than advanced armored vehicles, to confront the Soviet tank threat."

From: "Putting Weapons in Perspective" by Robert L. O'Connell in *Armed Forces and Society*, Vol 9, No 3, Spring 1983.

LOGISTICS WARRIORS: Supply - Viet Minh - 1954

"According to Bernard Fall, who wrote one of the best accounts of the battle, the Viet Minh had assembled 49,500 combatants supported by 31,500 support personnel, largely coolies. In addition Giap had 23,000 other troops along his main line of communication running north to the Chinese frontier. The French had about 13,200 men in the valley, of whom 7,000 were rated front-line combatants. Giap's forces thus enjoyed a superiority in manpower of five to one and immeasurably greater firepower.

Many authorities, Fall among them, believe that the battle was won by the coolies who kept the supplies moving toward the front over 500 miles of jungle road. More than 20,000 coolies and local tribesmen rebuilt Route 41 leading to Dien Bien Phu and widened the turns so that the road would take artillery pieces and the 800 Soviet-built Molotova trucks. These and the thousands of coolies were the core of the Viet Minh supply system."

From: *Crossroads of Modern Warfare* by Drew Middleton.

LOGISTICS WARRIORS: Choosing the Objective

"It can be seen that the selection of objectives is not an easy task. Even the seemingly simple matter of 'protecting access to vital raw materials' becomes complicated when applied to a specific situation. Yet, if we don't have the firm objectives, if we don't know where we are going, it is impossible to determine when we get there. That was one of the major problems of Vietnam and it will continue to be a problem in the future if we do not determine precisely what we are attempting to achieve with the use of military force. In other words, we (and perhaps what is more important, the American people) need to have a definition of 'victory.' This victory need not be a total destruction of the enemy or the complete conquest of his territory. It need only be the attainment of a political goal that prompted our involvement, such as the restoration of the status quo in the Korean war. It also should be recognized that in obtaining a decision on the precise definition of the objective, there is an inherent contradiction between the military and its civilian leaders. For both domestic and international political purposes the civilian leaders want maximum flexibility and maneuverability and are hesitant to fix on firm objectives. The military, on the other hand, need just such a firm objective as early as possible in order to plan and conduct military operations.

What we are faced with is the obverse of the problem President Kennedy faced when he issued an order in 1961 directing the Joint Chiefs of Staff to be 'more than military men.' Just as the military need to be aware of political, economic and social issues, so our civilian leadership must be aware of the imperatives of military operations. They need to understand that national policy affects not only selection of the military objective but also the very way that war is conducted. As Clausewitz put it, the primacy of policy in war rests on the assumption that 'policy knows the instrument it means to use. . . . A certain grasp of military affairs is vital for those in charge of general policy.' "

From: *On Strategy* by Colonel Harry G. Summers, Jr., USA.

LOGISTICS WARRIORS: Evacuation—Saigon Style

"Air Force CH-53s and Marine Corps helicopters continued the evacuation of Saigon. Thousands of Vietnamese surged around the American Embassy. Gunfire from small arms peppered the choppers, but no one knew who was doing the shooting. Earlier in the afternoon the American consul at Vung Tau, heading for the ships in the South China Sea in a commandeered boat, had been strafed by a South Vietnamese Air Force helicopter. The airborne command post, answering his plea for help, ordered an AC-130 gunship to "kill" the chopper. An electrical fire aboard the gunship forced it to break off the chase, but in the meantime the boat made it to safety. The incident confirmed the fear of Americans during the last days of Saigon that the Army of the Republic of Vietnam, at least some of it, was trying to disrupt the evacuation.

At midnight the weather and visibility remained good, so the evacuation continued. At 1:45 in the morning the Joint Rescue Control Center reported that 6,619 people had been carried out. An hour later the control center transmitted a presidential order that Americans only were to be evacuated from that time on. This would include several hundred members of the Marine ground security force.

As the sun came up there was panic among the thousands of Vietnamese swarming around the embassy walls. They climbed the barbed wire fence only to have U.S. Marines force them back with rifle butts. America's withdrawal from Vietnam came down to a rush to the top floors of the embassy. At 7:30 A.M. Marines slammed and barred the building's huge oak doors. One Marine shut off the elevators and then tossed tear gas grenades into the shaft. He then joined the others in a race up the stairs. At the fourth floor they turned to throw tear gas grenades down behind them. As they rushed the last steps to the rooftop helicopter pad, panic-gripped Vietnamese smashed through the doors below and surged through the gas into the embassy and up the stairwell. At the top of the stairs the Marines threw more gas and smoke grenades down the well, then they ran out onto the pad barring the small door behind them. They climbed aboard Swift 22, a waiting Marine CH-53. The turbines whined, the rotor blades moved around, picking up speed with each revolution. The ramp came up and the chopper lifted."

From: *Search and Rescue in Southeast Asia, 1961–1975* by Major Earl H. Tilford, Jr., USAF.

LOGISTICS WARRIORS: Military Needs

"The United States military needs sharp improvement in the reliability and maintainability of its weapons and technical systems. But the durable problems of weapons modernization and acquisition discussed earlier in these pages leave me profoundly skeptical about 'buy now, fix later' methods. America's military, like any other military, must have upgrading and evolution of its equipment. But this is something quite apart from buying now what will not serve later, or even long.

America's military needs careful study of authentic operational requirements in order to avoid the old problem of demanding performance levels that exceed requirements and hence result in degrading reliability. Further, in my opinion, the government must substantially enlarge its direct investment in military research and development. This is essential if only to regain necessary momentum in basic scientific and engineering research, the momentum requisite for keeping whatever technological edge the United States hopes to have. It has proven a thoroughgoing illusion to think that the government could transfer the costs of research and development to the private sector. One way or another, directly or indirectly, the government pays those costs, if not in dollars then in inefficiencies, lost industrial capacity, declining numbers of defense contractors, diminishing competition, and correspondingly diminished choices for defense officials.

In one sense, no major weapons program is a quick fix. It now takes twelve to fifteen years to carry a new weapon from concept to initial operational capability, and longer to complete a construction program on classes of ships, such as Trident missile submarines, large numbers of tanks such as the XM-1, or aircraft or missiles. But it is possible to spend a great deal of money on major weapons without solving, or even addressing, fundamental questions as to whether, or how, they will make America's military better. It is this blind faith that buying weapons will indeed improve America's military, and hence our national security, that makes major weapons part of the quick-fix approach to military adequacy."

From: *Defense or Delusion?* by Thomas H. Etzold.

LOGISTICS WARRIORS: Ethics and the Warrior

"If the military is to attempt to institutionalize a code of ethics, it must be prepared to reform the existing bureaucratic apparatus so as to weaken those institutional supports capable of resisting the new values. It is necessary to restructure the organizational apparatus of the military so as to develop institutional mechanisms for promulgating, sustaining, and enforcing a code of military ethics. Without such reforms in the bureaucracy, new values will not be adopted.

Finally, adequate enforcement mechanisms are crucial. In the enforcement of a code of military ethics, it must be understood that a code of ethics is not the equivalent of a body of law and that its enforcement mechanisms are not the equivalent of courts of law. Mechanisms for enforcing ethical codes within the profession should consist of formalized procedures for bringing to bear the consensus of the profession as to the obligations the membership must observe. To confuse law with ethical codes is a mistake. The honor court is a mechanism for enforcing a code of ethics and not a body of law. To confuse this point will inevitably lead to the degeneration of the honor court into one more forum for the spouting of sterile legalisms. There must, therefore, be a sense of communal trust among the membership of the profession to enforce the code with judgment and justice. If the military cannot trust its own membership to judge its own, to discipline its members, if it cannot trust its officers to behave ethically in pointing up and judging the suspect behavior of others, no amount of legal guarantees or lawyers will be able to engender that sense of trust for us."

"The task of ethical reform within the military is not an impossibility. It has already been carried out in other armies. If the German, the Japanese, and the British military establishments can establish honor courts and if we can establish them at our military academies, we ought to be able to establish them and make them work throughout the profession. Of course, the ability to carry out the task of formulating, instilling, and enforcing an ethical code must rest with the military itself.

The direct responsibility for these actions rests most clearly with the highest ranking leaders of the profession. Unless they are willing to provide the institutional support and, above all, the moral example to move the profession in the direction of constructing and enforcing a code of ethics, very little is likely to be achieved. History records no examples of ethical reforms that were self-generating or self-sustaining. The problems of the profession were made by men and they can be undone by men. The ability to set standards which ennoble men in their striving to attain them is perhaps one of the greatest qualities of the human character. It is this quality that must be brought to bear upon the problem of ethics by the top elites of the military profession.

In a democratic society based on capitalistic values, if the military does not take steps to insure its own sense of honor and ethics, the larger society cannot bear this burden for the profession. The importance of honor can never be underestimated. As one Canadian officer put it, 'all the soldier can bargain with is his honor and the honor of the soldier, like the virtue of a maiden, once taken cannot be restored.' It is the responsibility of the profession itself to set high ethical standards by which men may live, for it is only in setting high standards that the sacrifice which we require of the soldier can ever be justified."

From: *To Serve With Honor* by Richard A. Gabriel.

"I have soldiered for more than forty-two years and the more I have seen of war the more I realize how it all depends on administration and transportation (what our American Allies call logistics)."

(A.C.P. Wavell, *Generally Speaking,* 1946)

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